

Chapter 5

Appendix A Appendix Tables

Chapter 5. Academic Research and Development: Infrastructure and Performance

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Appendix table 5-1.

Expenditures for academic basic research, applied research, and development: 1960-95

	Total academic R&D	Basic research	Applied research	Development	Total academic R&D	Basic research	Applied research	Development	Basic research	Applied research	Development
	Millions of current dollars				Millions of constant 1987 dollars ¹				Percentage of total		
1960.....	646	433	179	34	2,475	1,659	686	130	67.0	27.7	5.3
1961.....	763	536	192	35	2,901	2,038	730	133	70.2	25.2	4.6
1962.....	904	659	205	40	3,373	2,459	765	149	72.9	22.7	4.4
1963.....	1,081	814	227	40	3,974	2,993	835	147	75.3	21.0	3.7
1964.....	1,275	1,003	232	40	4,620	3,634	841	145	78.7	18.2	3.1
1965.....	1,474	1,138	279	57	5,208	4,021	986	201	77.2	18.9	3.9
1966.....	1,715	1,303	328	84	5,893	4,478	1,127	289	76.0	19.1	4.9
1967.....	1,921	1,457	374	90	6,382	4,841	1,243	299	75.8	19.5	4.7
1968.....	2,149	1,650	403	96	6,888	5,288	1,292	308	76.8	18.8	4.5
1969.....	2,225	1,711	407	107	6,784	5,216	1,241	326	76.9	18.3	4.8
1970.....	2,335	1,796	427	112	6,749	5,191	1,234	324	76.9	18.3	4.8
1971.....	2,500	1,914	474	112	6,887	5,273	1,306	309	76.6	19.0	4.5
1972.....	2,630	2,022	524	84	6,885	5,293	1,372	220	76.9	19.9	3.2
1973.....	2,884	2,053	713	118	7,174	5,107	1,774	294	71.2	24.7	4.1
1974.....	3,022	2,153	736	133	6,979	4,972	1,700	307	71.2	24.4	4.4
1975.....	3,409	2,410	851	148	7,162	5,063	1,788	311	70.7	25.0	4.3
1976.....	3,729	2,549	1,016	164	7,283	4,979	1,984	320	68.4	27.2	4.4
1977.....	4,067	2,800	1,067	200	7,341	5,054	1,926	361	68.8	26.2	4.9
1978.....	4,625	3,133	1,184	308	7,760	5,257	1,987	517	67.7	25.6	6.7
1979.....	5,366	3,619	1,310	437	8,294	5,594	2,025	675	67.4	24.4	8.1
1980.....	6,063	4,036	1,530	497	8,588	5,717	2,167	704	66.6	25.2	8.2
1981.....	6,847	4,593	1,731	523	8,801	5,904	2,225	672	67.1	25.3	7.6
1982.....	7,323	4,878	1,858	587	8,760	5,835	2,222	702	66.6	25.4	8.0
1983.....	7,881	5,303	1,988	590	9,059	6,095	2,285	678	67.3	25.2	7.5
1984.....	8,620	5,732	2,254	634	9,483	6,306	2,480	697	66.5	26.1	7.4
1985.....	9,686	6,555	2,418	713	10,271	6,951	2,564	756	67.7	25.0	7.4
1986.....	10,927	7,491	2,628	808	11,253	7,715	2,706	832	68.6	24.1	7.4
1987.....	12,152	8,391	2,912	849	12,152	8,391	2,912	849	69.1	24.0	7.0
1988.....	13,462	8,893	3,516	1,053	12,994	8,584	3,394	1,016	66.1	26.1	7.8
1989.....	14,975	9,789	4,055	1,131	13,840	9,047	3,748	1,045	65.4	27.1	7.6
1990.....	16,283	10,640	4,346	1,297	14,538	9,500	3,880	1,158	65.3	26.7	8.0
1991.....	17,577	11,601	4,478	1,498	15,062	9,941	3,837	1,284	66.0	25.5	8.5
1992.....	18,794	12,504	4,714	1,576	15,649	10,411	3,925	1,312	66.5	25.1	8.4
1993.....	19,911	13,270	5,007	1,634	16,188	10,789	4,071	1,328	66.6	25.1	8.2
1994 (est.)....	20,950	14,100	5,190	1,660	16,707	11,244	4,139	1,324	67.3	24.8	7.9
1995 (est.)....	21,600	14,500	5,450	1,650	16,770	11,258	4,231	1,281	67.1	25.2	7.6

¹See appendix table 4-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *National Patterns of R&D Resources: 1994*, NSF 95-304 (Arlington, VA: NSF, 1995); and SRS, unpublished tabulations.

See figure 5-2.

Appendix table 5-2.

Support for academic R&D, by sector: FYs 1960–95

(page 1 of 2)

	Total	Federal Government	State/local government	Industry	Academic institutions	All other sources
Millions of current dollars						
1960	646	405	85	40	64	52
1961	763	500	95	40	70	58
1962	904	613	106	40	79	66
1963	1,081	760	118	41	89	73
1964	1,275	917	132	40	103	83
1965	1,474	1,073	143	41	124	93
1966	1,715	1,261	156	42	148	108
1967	1,921	1,409	164	48	181	119
1968	2,149	1,572	172	55	218	132
1969	2,225	1,600	197	60	223	145
1970	2,335	1,647	219	61	243	165
1971	2,500	1,724	255	70	274	177
1972	2,630	1,795	270	74	305	187
1973	2,884	1,985	295	84	318	202
1974	3,022	2,032	307	95	370	219
1975	3,409	2,288	332	113	417	259
1976	3,729	2,512	364	123	446	285
1977	4,067	2,726	374	139	514	314
1978 ¹	4,625	3,059	414	170	623	359
1979	5,366	3,598	472	193	735	368
1980	6,063	4,098	491	236	835	403
1981	6,847	4,571	546	292	1,004	435
1982	7,323	4,768	616	337	1,111	491
1983	7,881	4,989	626	389	1,302	576
1984	8,620	5,430	690	475	1,411	614
1985	9,686	6,063	752	560	1,617	694
1986	10,927	6,710	915	700	1,869	733
1987	12,152	7,342	1,023	790	2,169	828
1988	13,462	8,191	1,106	872	2,356	936
1989	14,975	8,988	1,223	995	2,698	1,071
1990	16,283	9,634	1,324	1,128	3,006	1,192
1991	17,577	10,230	1,473	1,205	3,362	1,307
1992	18,794	11,090	1,491	1,291	3,527	1,395
1993	19,911	11,957	1,559	1,374	3,552	1,469
1994 (est.) ¹	20,950	12,600	1,600	1,450	3,750	1,550
1995 (est.) ¹	21,600	13,000	1,600	1,500	3,900	1,600
Millions of constant 1987 dollars ²						
1960	2,475	1,552	326	153	245	199
1961	2,901	1,901	361	152	266	221
1962	3,373	2,287	396	149	295	246
1963	3,974	2,794	434	151	327	268
1964	4,620	3,322	478	145	373	301
1965	5,208	3,792	505	145	438	329
1966	5,893	4,333	536	144	509	371
1967	6,382	4,681	545	159	601	395
1968	6,888	5,038	551	176	699	423
1969	6,784	4,878	601	183	680	442
1970	6,749	4,760	633	176	702	477
1971	6,887	4,749	702	193	755	488
1972	6,885	4,699	707	194	798	490
1973	7,174	4,938	734	209	791	502
1974	6,977	4,691	709	219	854	506
1975	7,162	4,807	697	237	876	544
1976	7,283	4,906	711	240	871	557
1977	7,341	4,921	675	251	928	567
1978 ¹	7,760	5,133	695	285	1,045	602
1979	8,294	5,561	730	298	1,136	569

(continued)

Appendix table 5-2.

Support for academic R&D, by sector: FYs 1960–95
 (page 2 of 2)

	Total	Federal Government	State/local government	Industry	Academic institutions	All other sources
Millions of constant 1987 dollars ²						
1980	8,588	5,805	695	334	1,183	571
1981	8,801	5,875	702	375	1,290	559
1982	8,760	5,703	737	403	1,329	587
1983	9,059	5,734	720	447	1,497	662
1984	9,483	5,974	759	523	1,552	675
1985	10,271	6,429	797	594	1,715	736
1986	11,253	6,910	942	721	1,925	755
1987	12,152	7,342	1,023	790	2,169	828
1988	12,994	7,906	1,068	842	2,274	903
1989	13,840	8,307	1,130	920	2,494	990
1990	14,538	8,602	1,182	1,007	2,684	1,064
1991	15,062	8,766	1,262	1,033	2,881	1,120
1992	15,649	9,234	1,241	1,075	2,937	1,162
1993	16,188	9,721	1,267	1,117	2,888	1,194
1994 (est.) ¹	16,707	10,048	1,276	1,156	2,990	1,236
1995 (est.) ¹	16,770	10,093	1,242	1,165	3,028	1,242
Percent						
1960	100.0	62.7	13.2	6.2	9.9	8.0
1961	100.0	65.5	12.5	5.2	9.2	7.6
1962	100.0	67.8	11.7	4.4	8.7	7.3
1963	100.0	70.3	10.9	3.8	8.2	6.8
1964	100.0	71.9	10.4	3.1	8.1	6.5
1965	100.0	72.8	9.7	2.8	8.4	6.3
1966	100.0	73.5	9.1	2.4	8.6	6.3
1967	100.0	73.3	8.5	2.5	9.4	6.2
1968	100.0	73.2	8.0	2.6	10.1	6.1
1969	100.0	71.9	8.9	2.7	10.0	6.5
1970	100.0	70.5	9.4	2.6	10.4	7.1
1971	100.0	69.0	10.2	2.8	11.0	7.1
1972	100.0	68.3	10.3	2.8	11.6	7.1
1973	100.0	68.8	10.2	2.9	11.0	7.0
1974	100.0	67.2	10.2	3.1	12.2	7.2
1975	100.0	67.1	9.7	3.3	12.2	7.6
1976	100.0	67.4	9.8	3.3	12.0	7.6
1977	100.0	67.0	9.2	3.4	12.6	7.7
1978 ¹	100.0	66.1	9.0	3.7	13.5	7.8
1979	100.0	67.1	8.8	3.6	13.7	6.9
1980	100.0	67.6	8.1	3.9	13.8	6.6
1981	100.0	66.8	8.0	4.3	14.7	6.4
1982	100.0	65.1	8.4	4.6	15.2	6.7
1983	100.0	63.3	7.9	4.9	16.5	7.3
1984	100.0	63.0	8.0	5.5	16.4	7.1
1985	100.0	62.6	7.8	5.8	16.7	7.2
1986	100.0	61.4	8.4	6.4	17.1	6.7
1987	100.0	60.4	8.4	6.5	17.8	6.8
1988	100.0	60.8	8.2	6.5	17.5	7.0
1989	100.0	60.0	8.2	6.6	18.0	7.2
1990	100.0	59.2	8.1	6.9	18.5	7.3
1991	100.0	58.2	8.4	6.9	19.1	7.4
1992	100.0	59.0	7.9	6.9	18.8	7.4
1993	100.0	60.1	7.8	6.9	17.8	7.4
1994 (est.) ¹	100.0	60.1	7.6	6.9	17.9	7.4
1995 (est.) ¹	100.0	60.2	7.4	6.9	18.1	7.4

¹Relative amounts of funds from state and local governments and from academic institutions are estimated from previous year's ratio.²See appendix table 4-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *Academic Science and Engineering R&D Expenditures: Fiscal Year 1993, Detailed Statistical Tables*, NSF 95-332 (Arlington, VA: NSF, 1995); and SRS, annual series.

See figure 5-3.

Appendix table 5-3.

Sources of R&D funds at private and public institutions, by sector: 1973, 1983, and 1993

Year and institution type	Total	Federal Government	State/local government	Industry	Academic institutions	Other sources
Millions of dollars						
1973						
Private.....	1,080	846	31	33	66	103
Public	1,804	1,139	263	51	252	99
1983						
Private.....	2,772	2,122	53	145	233	219
Public	5,109	2,867	573	244	1,068	357
1993						
Private.....	6,549	4,788	143	478	577	563
Public	13,363	7,170	1,416	896	2,975	906
Percent						
1973						
Private.....	100.0	78.3	2.9	3.1	6.1	9.5
Public	100.0	63.1	14.6	2.8	14.0	5.5
1983						
Private.....	100.0	76.6	1.9	5.2	8.4	7.9
Public	100.0	56.1	11.2	4.8	20.9	7.0
1993						
Private.....	100.0	73.1	2.2	7.3	8.8	8.6
Public	100.0	53.7	10.6	6.7	22.3	6.8

SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *Academic Science and Engineering R&D Expenditures: Fiscal Year 1993, Detailed Statistical Tables*, NSF 95-332 (Arlington, VA: NSF, 1995); and SRS, annual series.

Science & Engineering Indicators – 1996

Appendix table 5-4.

R&D expenditures at the top 100 academic institutions, by source of funds: 1993
 (page 1 of 3)

Rank and academic institution	Institution type	Total	Federal Government	State/local government	Industry	Academic institutions	All other sources
Millions of dollars							
Total, all institutions		19,911	11,957	1,559	1,374	3,552	1,469
1 University of Michigan, all campuses	Public	426	250	5	27	104	40
2 University of Wisconsin-Madison	Public	372	214	60	12	48	38
3 Massachusetts Institute of Technology	Private	366	267	3	58	8	29
4 University of Washington	Public	335	269	8	31	20	7
5 University of Minnesota, all campuses	Public	332	175	50	22	65	21
6 Texas A&M University, all campuses	Public	323	123	82	27	86	5
7 University of California-San Francisco.....	Public	315	210	19	9	44	32
8 Cornell University, all campuses.....	Private	311	195	42	16	33	26
9 University of California-San Diego	Public	307	243	10	10	22	22
10 Stanford University	Private	307	254	1	15	19	17
Total, 1st 10 institutions		3,393	2,200	281	227	448	237
11 Johns Hopkins University ¹	Private	299	242	1	13	17	26
12 University of California-Berkeley.....	Public	284	156	29	12	68	19
13 Pennsylvania State U, all campuses	Public	283	160	8	42	73	0
14 University of California-Los Angeles	Public	278	189	6	14	35	34
15 Harvard University	Private	257	182	*	9	15	51
16 University of Illinois at Urbana-Champaign ..	Public	253	141	29	16	56	10
17 University of Texas at Austin	Public	249	139	18	4	64	24
18 University of Arizona	Public	236	113	5	13	82	21
19 University of Pennsylvania.....	Private	234	174	2	11	20	27
20 University of Maryland at College Park	Public	229	85	65	19	60	0
Total, 1st 20 institutions		5,995	3,782	444	381	938	450
21 Yale University	Private	227	169	2	10	21	25
22 University of California-Davis	Public	224	105	16	7	79	17
23 Ohio State University, all campuses	Public	221	109	30	14	31	38
24 Columbia University, Main Campus	Private	205	183	2	6	4	11
25 Duke University	Private	202	136	4	35	14	14
26 University of Southern California	Private	201	150	10	13	27	0
27 University of Colorado, all campuses	Public	193	139	3	12	16	24
28 Washington University.....	Private	179	129	4	19	14	13
29 University of North Carolina at Chapel Hill....	Public	179	131	19	3	27	0
30 University of Pittsburgh, all campuses.....	Public	179	142	*	10	13	13
Total, 1st 30 institutions		8,005	5,175	533	509	1,182	605
31 Georgia Institute of Technology, all campuses..	Public	176	98	2	29	47	0
32 University of Georgia.....	Public	172	52	34	9	76	1
33 Baylor College of Medicine	Private	172	88	3	10	21	50
34 University of Rochester	Private	162	131	7	8	4	12
35 Rutgers, the State University, all campuses..	Public	161	55	24	8	64	10
36 Louisiana State University, all campuses....	Public	159	53	56	9	31	10
37 North Carolina State University at Raleigh...	Public	156	62	51	22	19	1
38 Northwestern University.....	Private	154	78	1	9	49	17
39 Michigan State University	Public	151	70	26	6	35	13
40 Purdue University, all campuses.....	Public	149	73	18	13	36	9
Total, 1st 40 institutions		9,617	5,936	754	632	1,565	730

(continued)

Appendix table 5-4.

R&D expenditures at the top 100 academic institutions, by source of funds: 1993
 (page 2 of 3)

Rank and academic institution	Institution type	Total	Federal Government	State/local government	Industry	Academic institutions	All other sources
Millions of dollars							
41 University of Iowa	Public	149	93	3	10	32	10
42 Iowa State University.	Public	148	51	35	7	49	6
43 University of Tennessee, Central Office	Public	144	77	23	12	22	10
44 University of Florida	Public	143	72	10	11	43	7
45 Virginia Polytechnic Institute and State Univ .	Public	136	62	32	13	25	3
46 University of Alabama at Birmingham	Public	134	95	3	11	10	15
47 University of Connecticut, all campuses	Public	133	49	8	8	58	9
48 New York University	Private	130	94	1	5	10	19
49 SUNY at Buffalo, all campuses.	Public	128	81	6	6	19	16
50 Indiana University, all campuses	Public	128	77	2	5	27	17
Total, 1st 50 institutions		10,989	6,685	878	721	1,861	844
51 University of Texas MD Anderson Cancer Center. .	Public	127	41	0	0	62	25
52 Case Western Reserve University	Private	125	92	4	6	10	13
53 University of Miami	Private	121	91	2	11	5	12
54 Emory University.	Private	120	80	2	8	18	11
55 Carnegie Mellon University	Private	118	79	6	18	7	9
56 University of Virginia, all campuses.	Public	118	76	6	10	13	13
57 California Institute of Technology	Private	115	104	*	4	4	3
58 Colorado State University	Public	115	69	14	5	25	2
59 Univ. of Texas Southwestern Med Ctr Dallas .	Public	114	68	*	11	7	28
60 Oregon State University.	Public	114	61	28	4	12	9
Total, 1st 60 institutions		12,178	7,446	941	800	2,024	968
61 University of Chicago	Private	112	96	*	2	5	9
62 Univ. of Maryland Baltimore Professional Schs. .	Public	112	54	23	14	15	6
63 SUNY at Stony Brook, all campuses.	Public	108	68	1	5	29	5
64 University of Missouri, Columbia.	Public	106	30	14	8	48	7
65 University of Illinois at Chicago.	Public	106	50	5	5	32	14
66 University of Utah	Public	105	83	*	4	11	7
67 University of Kentucky, all campuses	Public	103	47	6	10	35	5
68 University of California-Irvine	Public	101	65	6	5	14	12
69 Princeton University	Private	99	57	*	6	24	11
70 Vanderbilt University	Private	96	84	*	3	5	5
Total, 1st 70 institutions		13,225	8,079	997	861	2,242	1,047
71 University of Nebraska at Lincoln	Public	95	24	35	2	23	11
72 University of Cincinnati, all campuses	Public	93	57	2	11	17	6
73 Washington State University	Public	92	44	5	3	32	9
74 University of Oklahoma, all campuses.	Public	92	33	11	4	30	14
75 Boston University	Private	91	72	*	10	0	9
76 Yeshiva University	Private	90	72	*	2	11	5
77 New Mexico State University, all campuses..	Public	86	65	9	3	8	*
78 Wayne State University	Public	86	40	6	8	23	8
79 University of Kansas, all campuses.	Public	85	38	6	4	33	4
80 Woods Hole Oceanographic Institution	Private	82	74	*	*	1	6
Total, 1st 80 institutions		14,116	8,597	1,072	908	2,420	1,118
81 Clemson University.	Public	79	23	15	6	30	4

(continued)

Appendix table 5-4.

R&D expenditures at the top 100 academic institutions, by source of funds: 1993
 (page 3 of 3)

Rank and academic institution	Institution type	Total	Federal Government	State/local government	Industry	Academic institutions	All other sources
———— Millions of dollars ——							
82 Utah State University	Public	77	45	12	3	15	1
83 Virginia Commonwealth University	Public	77	49	2	7	17	2
84 University of New Mexico, all campuses	Public	77	43	3	5	14	11
85 University of Medicine and Dentistry of New Jersey.	Public	76	36	5	7	21	7
86 Tulane University of Louisiana	Private	76	37	2	7	24	6
87 Mount Sinai School of Medicine	Private	75	50	1	6	8	10
88 University of South Florida.	Public	75	17	6	5	41	6
89 University of Texas Health Science at San Antonio.	Public	75	48	6	7	10	4
90 Rockefeller University	Private	74	37	*	5	16	16
Total, 1st 90 institutions		14,878	8,981	1,125	966	2,617	1,188
91 University of Hawaii at Manoa	Public	74	41	27	*	3	2
92 Georgetown University	Private	74	48	*	6	13	7
93 Oklahoma State University, all campuses	Public	73	21	10	4	36	2
94 Mississippi State University	Public	70	30	19	6	8	7
95 University of California-Santa Barbara	Public	69	54	2	2	6	4
96 Auburn University, all campuses.	Public	68	17	23	6	17	5
97 University of Texas Medical Branch at Galveston	Public	68	31	8	5	16	8
98 Univ. of Alaska-Fairbanks, all campuses.	Public	67	42	3	5	17	*
99 Arizona State University	Public	66	30	1	5	29	2
100 University of Massachusetts at Amherst.	Public	64	32	5	5	15	6
Total, 1st 100 institutions		15,571	9,327	1,223	1,009	2,778	1,233

* = less than \$1 million

¹These figures exclude the Applied Physics Laboratory (APL) at Johns Hopkins University, which is similar to a federally funded research and development center and dominates the R&D performed at the university. In 1993, APL had total R&D expenditures of \$447 million, of which \$431 million were provided by Federal sources.

SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *Academic Science and Engineering R&D Expenditures: Fiscal Year 1993*, Detailed Statistical Tables, NSF 95-332 (Arlington, VA: NSF, 1995); and SRS, unpublished tabulations.

Appendix table 5-5.

Federal and nonfederal R&D expenditures at academic institutions, by field and source of funds: 1993

Field	Total		Federal	Nonfederal ¹	Federal	Nonfederal ¹
	Thousands of dollars	Percent	Thousands of dollars		Percent	
Total science and engineering	19,911,352	100.0	11,957,140	7,954,212	60.1	39.9
Total sciences	16,760,054	84.2	10,098,924	6,661,130	60.3	39.7
Physical sciences	2,124,377	10.7	1,513,451	610,926	71.2	28.8
Astronomy	251,878	1.3	158,506	93,372	62.9	37.1
Chemistry	735,633	3.7	501,651	233,982	68.2	31.8
Physics	928,334	4.7	701,552	226,782	75.6	24.4
Other	208,532	1.0	151,742	56,790	72.8	27.2
Mathematical sciences	272,133	1.4	203,004	69,129	74.6	25.4
Computer sciences	597,339	3.0	421,635	175,704	70.6	29.4
Environmental sciences	1,317,619	6.6	870,361	447,258	66.1	33.9
Atmospheric sciences	211,611	1.1	160,405	51,206	75.8	24.2
Earth sciences	415,444	2.1	242,450	172,994	58.4	41.6
Oceanography	460,566	2.3	331,637	128,929	72.0	28.0
Other	229,998	1.2	135,869	94,129	59.1	40.9
Life sciences	10,827,725	54.4	6,382,815	4,444,910	58.9	41.1
Agricultural sciences	1,558,090	7.8	449,710	1,108,380	28.9	71.1
Biological sciences	3,536,452	17.8	2,312,449	1,224,003	65.4	34.6
Medical sciences	5,285,269	26.5	3,351,137	1,934,132	63.4	36.6
Other	447,914	2.2	269,519	178,395	60.2	39.8
Psychology	349,344	1.8	234,186	115,158	67.0	33.0
Social sciences	896,139	4.5	338,031	558,108	37.7	62.3
Economics	231,208	1.2	77,253	153,955	33.4	66.6
Political science	152,960	0.8	44,266	108,694	28.9	71.1
Sociology	183,562	0.9	91,092	92,470	49.6	50.4
Other	328,409	1.6	125,420	202,989	38.2	61.8
Other sciences	375,378	1.9	135,441	239,937	36.1	63.9
Total engineering	3,151,298	15.8	1,858,216	1,293,082	59.0	41.0
Aeronautical/astronautical	206,218	1.0	158,871	47,347	77.0	23.0
Chemical	269,220	1.4	140,929	128,291	52.3	47.7
Civil	367,091	1.8	152,354	214,737	41.5	58.5
Electrical/electronic	696,243	3.5	458,102	238,141	65.8	34.2
Mechanical	480,294	2.4	309,956	170,338	64.5	35.5
Materials	302,049	1.5	152,417	149,632	50.5	49.5
Other	830,183	4.2	485,587	344,596	58.5	41.5

¹See appendix table 5-2 for detail on nonfederal sources.SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *Academic Science and Engineering R&D Expenditures: Fiscal Year 1993, Detailed Statistical Tables*, NSF 95-332 (Arlington, VA: NSF, 1995); and SRS, unpublished tabulations.

Appendix table 5-6.

Expenditures for academic R&D, by field: 1983–93
(page 1 of 2)

Field	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Millions of current dollars											
Total S&E	7,881	8,620	9,686	10,927	12,152	13,462	14,975	16,283	17,577	18,794	19,911
Total sciences	6,759	7,388	8,268	9,285	10,259	11,367	12,581	13,628	14,674	15,733	16,759
Physical sciences	901	1,001	1,148	1,286	1,398	1,554	1,646	1,806	1,939	2,051	2,124
Astronomy	73	80	96	102	108	127	137	170	210	233	252
Chemistry	335	372	421	469	513	565	606	647	666	697	736
Physics	418	474	551	631	673	740	786	842	870	913	928
Other	74	74	80	85	103	122	117	147	193	209	209
Mathematical sciences	106	123	128	152	177	199	215	222	230	247	272
Computer sciences	186	224	281	321	372	408	473	515	554	556	597
Environmental sciences	617	645	705	776	839	894	1,003	1,068	1,116	1,239	1,318
Atmospheric sciences	99	102	108	121	132	138	165	173	175	194	212
Earth sciences	216	228	254	274	284	294	324	354	383	412	415
Oceanography	224	236	258	280	299	333	359	377	390	428	461
Other	78	79	86	101	123	128	156	163	169	204	230
Life sciences	4,303	4,711	5,279	5,890	6,528	7,257	8,060	8,725	9,471	10,183	10,828
Agricultural sciences	921	954	999	1,089	1,121	1,176	1,282	1,349	1,458	1,512	1,558
Biological sciences	1,419	1,573	1,780	1,946	2,143	2,407	2,639	2,858	3,062	3,296	3,536
Medical sciences	1,830	2,034	2,318	2,616	3,000	3,378	3,819	4,155	4,547	4,960	5,285
Other	132	150	181	240	264	296	321	363	404	415	448
Psychology	136	145	158	170	187	213	233	253	283	328	349
Social sciences	345	359	383	462	502	552	633	703	750	815	896
Economics	98	109	118	136	149	163	187	201	209	222	231
Political science	55	56	59	69	81	87	103	115	125	142	153
Sociology	78	70	75	96	95	108	119	132	156	163	184
Other	115	124	131	162	177	194	224	255	260	288	328
Other sciences	165	180	186	228	256	290	318	336	331	314	375
Total engineering	1,122	1,232	1,418	1,641	1,892	2,096	2,392	2,656	2,903	3,060	3,151
Aeronautical/astronautical	68	70	81	94	108	123	148	163	180	196	206
Chemical	96	102	116	132	148	163	194	218	244	261	269
Civil	127	140	153	178	191	224	245	284	315	339	367
Electrical/electronic	262	295	337	395	451	509	595	663	679	702	696
Mechanical	149	179	208	228	275	304	343	391	421	452	480
Materials	NA	NA	NA	NA	NA	NA	NA	274	304	292	302
Other	420	447	523	613	719	774	867	663	760	816	830

(continued)

Appendix table 5-6.

Expenditures for academic R&D, by field: 1983–93

(page 2 of 2)

Field	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Millions of constant 1987 dollars ¹											
Total S&E	9,059	9,483	10,271	11,253	12,152	12,994	13,840	14,538	15,062	15,649	16,188
Total sciences	7,769	8,128	8,768	9,562	10,259	10,972	11,628	12,168	12,574	13,100	13,625
Physical sciences	1,036	1,101	1,217	1,324	1,398	1,500	1,521	1,613	1,662	1,708	1,727
Astronomy	84	88	102	105	108	123	127	152	180	194	205
Chemistry	385	409	446	483	513	545	560	578	571	580	598
Physics	480	521	584	650	673	714	726	752	746	760	754
Other	85	81	85	88	103	118	108	131	165	174	170
Mathematical sciences	122	135	136	157	177	192	199	198	197	206	221
Computer sciences	214	246	298	331	372	394	437	460	475	463	485
Environmental sciences	709	710	748	799	839	863	927	954	956	1,032	1,072
Atmospheric sciences	114	112	115	125	132	133	152	154	150	162	172
Earth sciences	248	251	269	282	284	284	299	316	328	343	337
Oceanography	257	260	274	288	299	321	332	337	334	356	375
Other	90	87	91	104	123	124	144	146	145	170	187
Life sciences	4,946	5,183	5,598	6,066	6,528	7,005	7,449	7,790	8,116	8,479	8,803
Agricultural sciences	1,059	1,050	1,059	1,122	1,121	1,135	1,185	1,204	1,249	1,259	1,267
Biological sciences	1,631	1,730	1,888	2,004	2,143	2,323	2,439	2,552	2,624	2,744	2,875
Medical sciences	2,103	2,238	2,458	2,694	3,000	3,261	3,530	3,710	3,896	4,130	4,297
Other	152	165	192	247	264	286	297	324	346	346	364
Psychology	156	160	168	175	187	206	215	226	243	273	284
Social sciences	397	395	406	476	502	533	585	628	643	679	728
Economics	113	120	125	140	149	157	173	179	179	185	188
Political science	63	62	63	71	81	84	95	103	107	118	124
Sociology	90	77	80	99	95	104	110	118	134	136	150
Other	132	136	139	167	177	187	207	228	223	240	267
Other sciences	190	198	197	235	256	280	294	300	284	261	305
Total engineering	1,290	1,355	1,504	1,690	1,892	2,023	2,211	2,371	2,488	2,548	2,562
Aeronautical/astronautical	78	77	86	97	108	119	137	146	154	163	167
Chemical	110	112	123	136	148	157	179	195	209	217	219
Civil	146	154	162	183	191	216	226	254	270	282	298
Electrical/electronic	301	325	357	407	451	491	550	592	582	585	566
Mechanical	171	197	221	235	275	293	317	349	361	376	390
Materials	NA	NA	NA	NA	NA	NA	NA	244	260	243	246
Other	483	492	555	631	719	747	801	592	651	680	675

NA = not available; S&E = science and engineering

¹See appendix table 4-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *Academic Science and Engineering R&D Expenditures: Fiscal Year 1993, Detailed Statistical Tables*, NSF 95-332 (Arlington, VA: NSF, 1995); and SRS, unpublished tabulations.

See figure 5-5.

Appendix table 5-7.

Federal financing of academic R&D funds, by field: 1973-93

Field	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	
Percentage federally financed																						
Total S&E	68.8	67.2	67.1	67.4	67.0	66.1	67.1	67.6	66.8	65.1	63.3	63.0	62.6	61.4	60.4	60.8	60.0	59.2	58.2	59.0	60.1	
Total sciences	68.5	67.0	67.0	67.4	67.0	65.9	66.8	67.4	66.5	64.8	62.9	62.8	62.8	61.7	60.7	61.2	60.4	59.5	58.6	59.3	60.3	
Physical sciences	81.8	81.0	81.4	80.5	80.0	79.0	81.5	81.9	80.8	78.8	77.7	78.1	77.5	76.3	75.2	74.5	72.7	72.8	71.4	71.9	71.2	
Astronomy	73.4	70.0	73.4	69.8	71.8	71.6	74.8	75.6	71.0	70.6	68.0	66.1	67.0	68.5	65.7	66.1	64.1	66.2	64.3	65.8	62.9	
Chemistry	76.1	76.6	76.8	77.0	76.2	75.4	75.8	77.7	76.0	74.7	73.8	75.0	74.2	72.0	71.7	71.3	69.5	68.7	67.1	68.3	68.2	
Physics	87.1	86.6	86.4	85.3	85.2	84.7	86.5	86.8	86.4	83.5	82.1	82.3	82.2	80.9	79.4	78.4	77.1	77.5	76.8	76.7	75.6	
Other	79.7	74.4	77.7	77.2	73.7	69.7	82.7	78.7	81.1	81.2	80.5	80.1	75.1	75.8	75.1	74.7	69.5	71.8	69.0	69.8	72.8	
Mathematical sciences	77.5	78.4	78.6	77.4	77.7	75.1	77.6	78.4	77.8	74.5	71.9	75.0	75.9	75.5	74.4	75.4	73.3	72.6	74.1	74.0	74.6	
Computer sciences	69.9	73.2	74.3	74.0	67.6	61.1	70.9	70.4	72.4	74.2	74.6	72.7	69.7	72.4	69.1	70.8	68.5	66.5	67.0	68.3	70.6	
Environmental sciences	75.2	71.7	70.8	73.4	74.7	72.5	72.6	73.1	71.1	70.1	69.1	69.1	67.2	66.6	65.0	65.9	64.8	63.7	62.6	63.8	66.1	
Atmospheric sciences	NA	84.1	77.0	79.9	78.4	80.7	79.8	81.2	82.0	81.2	77.9	75.7	74.1	72.1	75.8							
Earth sciences	NA	69.7	67.1	64.9	62.4	61.4	60.7	58.3	56.2	59.3	57.7	57.7	56.6	57.7	58.4							
Oceanography	NA	77.6	77.9	77.4	76.6	76.4	72.7	74.3	72.6	71.6	72.5	69.4	67.6	71.6	72.0							
Other	75.2	71.7	70.8	73.4	74.7	72.5	72.6	59.1	58.0	53.5	54.2	54.0	53.9	50.3	48.9	49.8	48.1	51.0	52.9	51.8	59.1	
Life sciences	66.3	64.5	65.1	65.7	65.3	64.1	64.1	64.9	64.0	62.4	60.2	60.1	60.4	59.3	58.8	59.6	59.3	58.2	57.2	58.0	58.9	
Agricultural sciences	34.1	29.2	29.4	29.7	28.8	29.8	30.2	30.9	29.7	29.5	28.4	28.2	29.4	26.8	26.6	27.4	27.3	26.1	25.9	27.6	28.9	
Biological sciences	71.6	71.7	72.5	73.5	74.5	73.0	72.6	74.0	73.0	71.4	69.5	69.5	67.9	67.4	66.2	66.8	65.7	64.5	63.6	64.9	65.4	
Medical sciences	75.3	75.9	75.6	75.5	74.9	73.1	73.7	74.4	74.1	72.0	68.9	67.6	68.0	66.6	65.4	65.5	65.5	64.3	62.7	62.8	63.4	
Other	70.3	72.5	71.8	72.6	71.7	70.4	70.1	67.3	67.5	64.0	61.0	62.9	60.0	61.3	59.8	61.7	61.0	59.1	60.0	57.7	60.2	
Psychology	79.5	78.9	76.8	76.2	74.8	71.4	72.3	73.3	72.7	68.2	66.1	67.4	67.0	67.0	66.1	65.9	65.5	64.8	65.8	65.4	67.0	
Social sciences	57.3	56.9	55.2	52.7	51.6	50.6	53.0	53.8	51.0	45.6	42.6	39.8	40.1	37.4	33.6	34.2	33.5	32.2	33.7	34.5	37.7	
Economics	47.6	46.6	48.2	44.5	43.8	46.9	48.4	48.8	45.4	43.7	39.6	39.1	37.0	33.5	29.1	30.2	29.1	27.1	28.6	29.8	33.4	
Political science	40.6	44.0	41.8	42.2	46.2	43.4	46.0	43.4	42.0	37.3	36.8	33.9	33.1	29.4	29.7	29.0	25.0	22.0	22.8	24.7	28.9	
Sociology	65.8	65.1	65.5	62.1	61.1	60.7	63.4	65.0	60.5	58.5	55.3	54.0	53.5	51.2	46.2	44.1	45.3	45.5	46.3	50.1	49.6	
Other	61.0	60.0	55.9	54.8	52.9	49.4	52.2	54.1	52.3	42.8	39.3	35.3	38.5	35.8	32.4	34.4	34.9	33.9	35.5	34.2	38.2	
Other sciences	58.7	57.1	57.2	59.5	54.9	58.1	54.9	53.6	56.5	56.5	52.7	48.5	49.3	47.1	44.8	41.9	40.1	41.1	33.8	33.4	36.1	
Total engineering	71.5	69.0	68.1	67.3	67.6	67.8	68.7	68.6	68.5	67.2	65.5	64.0	61.2	59.6	58.8	58.7	57.8	57.4	56.4	57.3	59.0	
Aeronautical/astronautical	NA	79.5	80.0	79.1	78.7	78.2	76.4	77.0	74.1	76.3	77.5	77.7	76.4	76.7	77.0							
Chemical	NA	64.4	66.9	62.0	59.5	59.1	55.6	55.4	51.7	52.6	52.1	50.6	48.4	48.4	52.3							
Civil	NA	64.0	56.8	51.5	50.4	51.8	51.5	49.6	47.0	45.6	41.7	41.2	39.3	42.3	41.5							
Electrical/electronic	NA	75.7	75.9	77.1	73.8	71.0	67.7	65.9	64.8	64.9	65.0	65.1	64.2	64.0	65.8							
Mechanical	NA	67.0	67.5	68.3	67.1	66.5	64.6	64.9	64.9	63.5	62.4	61.0	59.7	59.8	64.5							
Materials	NA	65.5	50.9	50.4	48.4	50.5																
Other	71.5	69.0	68.1	67.3	67.6	67.8	68.7	65.7	67.3	65.3	63.5	61.1	57.3	54.6	55.0	54.9	53.6	54.6	55.1	57.6	58.5	

NA = not available; S&E = science and engineering

SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *Academic Science and Engineering R&D Expenditures Fiscal Year 1993, Detailed Statistical Tables*, NSF 95-332 (Arlington, VA: NSF, 1995); and SRS, annual series.

Appendix table 5-8.

Federal obligations for academic R&D, by agency: 1971–95

(page 1 of 2)

	All agencies	National Institutes of Health	National Science Foundation	Department of Defense	National Aeronautics & Space Admin.	Department of Energy ¹	Department of Agriculture	All other agencies
Millions of current dollars								
1971.....	1,645	603	267	211	134	94	72	264
1972.....	1,904	756	362	217	119	85	87	277
1973.....	1,917	826	374	204	111	83	94	289
1974.....	2,214	1,108	389	197	99	94	95	312
1975.....	2,411	1,154	435	203	108	132	108	348
1976.....	2,552	1,263	437	240	119	145	120	307
1977.....	2,905	1,399	511	273	118	188	140	364
1978.....	3,375	1,588	537	383	127	240	186	408
1979.....	3,889	1,880	617	438	139	260	200	470
1980.....	4,263	2,012	685	495	158	285	216	536
1981.....	4,466	2,101	702	573	171	300	243	492
1982.....	4,605	2,140	715	664	186	277	255	483
1983.....	4,966	2,392	783	724	189	297	275	434
1984.....	5,547	2,715	880	830	204	321	261	491
1985.....	6,340	3,158	1,002	940	237	357	293	536
1986.....	6,559	3,243	992	1,098	254	345	274	553
1987.....	7,337	3,903	1,096	1,017	294	386	280	626
1988.....	7,828	4,199	1,143	1,071	338	406	305	678
1989.....	8,672	4,565	1,254	1,189	434	454	328	858
1990.....	9,142	4,779	1,321	1,213	471	500	348	984
1991.....	10,169	5,521	1,436	1,152	534	621	386	1,379
1992.....	10,271	5,064	1,540	1,403	586	640	438	600
1993.....	11,156	5,795	1,562	1,616	614	583	433	553
1994 (est.)....	11,969	6,146	1,678	1,726	733	633	454	599
1995 (est.)....	12,097	6,428	1,816	1,476	736	621	424	596
Millions of constant 1987 dollars ²								
1971.....	4,531	1,662	734	581	369	259	198	727
1972.....	4,983	1,979	949	567	312	221	229	726
1973.....	4,768	2,054	932	507	277	206	234	719
1974.....	5,113	2,558	899	456	228	217	219	722
1975.....	5,066	2,423	914	427	227	277	227	732
1976.....	4,984	2,466	853	470	232	283	234	599
1977.....	5,245	2,526	922	493	212	340	253	657
1978.....	5,662	2,664	901	643	213	403	313	684
1979.....	6,011	2,906	953	677	214	402	309	727
1980.....	6,039	2,850	970	702	223	404	307	759
1981.....	5,740	2,700	902	736	220	386	312	632
1982.....	5,509	2,560	855	794	222	331	305	578
1983.....	5,709	2,749	900	832	218	341	316	499
1984.....	6,102	2,987	968	913	224	353	287	540
1985.....	6,723	3,348	1,062	997	252	379	311	568
1986.....	6,755	3,339	1,021	1,131	262	355	282	570
1987.....	7,337	3,903	1,096	1,017	294	386	280	626
1988.....	7,556	4,053	1,104	1,034	326	392	294	655
1989.....	8,015	4,219	1,159	1,099	401	419	303	793
1990.....	8,163	4,267	1,179	1,083	421	446	311	879
1991.....	8,713	4,731	1,230	987	457	532	331	1,181
1992.....	8,552	4,216	1,282	1,168	488	533	365	500
1993.....	9,070	4,711	1,270	1,314	499	474	352	450
1994 (est.)....	9,545	4,901	1,338	1,376	585	505	362	478
1995 (est.)....	9,392	4,991	1,410	1,146	571	482	329	463

(continued)

Appendix table 5-8.

Federal obligations for academic R&D, by agency: 1971–95

(page 2 of 2)

	All agencies	National Institutes of Health	National Science Foundation	Department of Defense	National Aeronautics & Space Admin.	Department of Energy ¹	Department of Agriculture	All other agencies
Percent								
1971.....	100.0	36.7	16.2	12.8	8.2	5.7	4.4	16.0
1972.....	100.0	39.7	19.0	11.4	6.3	4.4	4.6	14.6
1973.....	100.0	43.1	19.5	10.6	5.8	4.3	4.9	15.1
1974.....	100.0	50.0	17.6	8.9	4.5	4.2	4.3	14.1
1975.....	100.0	47.8	18.0	8.4	4.5	5.5	4.5	14.4
1976.....	100.0	49.5	17.1	9.4	4.7	5.7	4.7	12.0
1977.....	100.0	48.2	17.6	9.4	4.0	6.5	4.8	12.5
1978.....	100.0	47.0	15.9	11.4	3.8	7.1	5.5	12.1
1979.....	100.0	48.4	15.9	11.3	3.6	6.7	5.1	12.1
1980.....	100.0	47.2	16.1	11.6	3.7	6.7	5.1	12.6
1981.....	100.0	47.0	15.7	12.8	3.8	6.7	5.4	11.0
1982.....	100.0	46.5	15.5	14.4	4.0	6.0	5.5	10.5
1983.....	100.0	48.2	15.8	14.6	3.8	6.0	5.5	8.7
1984.....	100.0	49.0	15.9	15.0	3.7	5.8	4.7	8.8
1985.....	100.0	49.8	15.8	14.8	3.7	5.6	4.6	8.5
1986.....	100.0	49.4	15.1	16.7	3.9	5.3	4.2	8.4
1987.....	100.0	53.2	14.9	13.9	4.0	5.3	3.8	8.5
1988.....	100.0	53.6	14.6	13.7	4.3	5.2	3.9	8.7
1989.....	100.0	52.6	14.5	13.7	5.0	5.2	3.8	9.9
1990.....	100.0	52.3	14.4	13.3	5.2	5.5	3.8	10.8
1991.....	100.0	54.3	14.1	11.3	5.2	6.1	3.8	13.6
1992.....	100.0	49.3	15.0	13.7	5.7	6.2	4.3	5.8
1993.....	100.0	51.9	14.0	14.5	5.5	5.2	3.9	5.0
1994 (est.)....	100.0	51.3	14.0	14.4	6.1	5.3	3.8	5.0
1995 (est.)....	100.0	53.1	15.0	12.2	6.1	5.1	3.5	4.9

NOTE: Percentages may not total 100 because of rounding.

¹Data for 1974–76 are the Energy Research and Development Administration; and for 1977–95, the Department of Energy.²See appendix table 4-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *Federal Funds for Research and Development: Fiscal Years 1993, 1994, and 1995, Detailed Statistical Tables*, Volume 43, NSF 95-334 (Arlington, VA: NSF, 1995); and SRS, annual series.

Appendix table 5-9.

Federal obligations for academic research, by agency: 1971–95

(page 1 of 2)

	All agencies	National Institutes of Health	National Science Foundation	Department of Defense	National Aeronautics & Space Admin.	Department of Energy ¹	Department of Agriculture	All other agencies
— Millions of current dollars —								
1971	1,430	551	254	184	70	90	72	209
1972	1,643	677	346	177	48	81	87	226
1973	1,691	749	370	161	80	79	94	158
1974	1,958	1,004	369	167	85	86	94	153
1975	2,079	1,036	420	165	91	112	108	148
1976	2,250	1,138	429	192	98	116	119	158
1977	2,584	1,269	505	221	105	134	139	211
1978	2,928	1,437	534	243	116	175	181	241
1979	3,333	1,657	612	271	125	204	198	266
1980	3,699	1,835	680	313	146	224	214	287
1981	3,920	1,929	698	363	157	248	240	284
1982	4,045	1,995	713	413	156	236	253	280
1983	4,468	2,246	783	472	170	273	273	250
1984	5,030	2,573	880	539	177	311	260	290
1985	5,726	2,990	1,002	587	213	336	292	305
1986	5,883	3,054	992	707	225	334	273	298
1987	6,640	3,651	1,096	681	263	372	279	298
1988	7,023	3,856	1,143	729	310	384	304	297
1989	7,793	4,167	1,254	840	387	437	326	382
1990	8,137	4,349	1,321	795	422	479	346	426
1991	8,868	4,729	1,436	794	474	596	384	456
1992	9,061	4,517	1,540	912	512	605	436	538
1993	9,844	5,204	1,562	1,090	539	547	429	473
1994 (est.)	10,610	5,520	1,678	1,206	652	591	450	513
1995 (est.)	10,839	5,774	1,816	1,113	652	570	420	494
— Millions of constant 1987 dollars ² —								
1971	3,939	1,518	700	507	193	248	198	576
1972	4,301	1,773	906	462	126	212	229	592
1973	4,207	1,863	921	399	200	196	234	393
1974	4,523	2,319	852	386	196	198	218	353
1975	4,367	2,175	882	347	191	236	226	311
1976	4,394	2,222	837	374	191	227	233	309
1977	4,663	2,290	911	399	190	242	251	382
1978	4,913	2,411	896	407	195	293	304	405
1979	5,152	2,561	946	419	194	315	306	411
1980	5,239	2,599	963	443	207	317	304	406
1981	5,039	2,480	897	467	202	319	309	365
1982	4,839	2,386	853	494	186	282	303	335
1983	5,136	2,582	900	543	195	314	314	288
1984	5,533	2,831	968	593	195	343	285	319
1985	6,072	3,171	1,062	623	226	356	310	324
1986	6,059	3,145	1,021	729	232	344	281	307
1987	6,640	3,651	1,096	681	263	372	279	298
1988	6,779	3,722	1,104	703	299	371	294	286
1989	7,203	3,851	1,159	776	358	404	302	353
1990	7,265	3,883	1,179	710	377	428	309	380
1991	7,599	4,052	1,230	680	407	510	329	390
1992	7,544	3,761	1,283	760	426	504	363	448
1993	8,003	4,231	1,270	886	438	445	349	385
1994 (est.)	8,461	4,402	1,338	962	520	471	359	409
1995 (est.)	8,415	4,483	1,410	864	506	443	326	384

(continued)

Appendix table 5-9.

Federal obligations for academic research, by agency: 1971–95

(page 2 of 2)

	All agencies	National Institutes of Health	National Science Foundation	Department of Defense	National Aeronautics & Space Admin.	Department of Energy ¹	Department of Agriculture	All other agencies
	Percent							
1971	100.0	38.5	17.8	12.9	4.9	6.3	5.0	14.6
1972	100.0	41.2	21.1	10.8	2.9	4.9	5.3	13.8
1973	100.0	44.3	21.9	9.5	4.8	4.7	5.6	9.3
1974	100.0	51.3	18.8	8.5	4.3	4.4	4.8	7.8
1975	100.0	49.8	20.2	7.9	4.4	5.4	5.2	7.1
1976	100.0	50.6	19.1	8.5	4.3	5.2	5.3	7.0
1977	100.0	49.1	19.5	8.6	4.1	5.2	5.4	8.2
1978	100.0	49.1	18.2	8.3	4.0	6.0	6.2	8.2
1979	100.0	49.7	18.4	8.1	3.8	6.1	5.9	8.0
1980	100.0	49.6	18.4	8.5	3.9	6.1	5.8	7.8
1981	100.0	49.2	17.8	9.3	4.0	6.3	6.1	7.2
1982	100.0	49.3	17.6	10.2	3.9	5.8	6.3	6.9
1983	100.0	50.3	17.5	10.6	3.8	6.1	6.1	5.6
1984	100.0	51.2	17.5	10.7	3.5	6.2	5.2	5.8
1985	100.0	52.2	17.5	10.3	3.7	5.9	5.1	5.3
1986	100.0	51.9	16.9	12.0	3.8	5.7	4.6	5.1
1987	100.0	55.0	16.5	10.3	4.0	5.6	4.2	4.5
1988	100.0	54.9	16.3	10.4	4.4	5.5	4.3	4.2
1989	100.0	53.5	16.1	10.8	5.0	5.6	4.2	4.9
1990	100.0	53.4	16.2	9.8	5.2	5.9	4.2	5.2
1991	100.0	53.3	16.2	9.0	5.4	6.7	4.3	5.1
1992	100.0	49.9	17.0	10.1	5.6	6.7	4.8	5.9
1993	100.0	52.9	15.9	11.1	5.5	5.6	4.4	4.8
1994 (est.)	100.0	52.0	15.8	11.4	6.1	5.6	4.2	4.8
1995 (est.)	100.0	53.3	16.8	10.3	6.0	5.3	3.9	4.6

NOTES: Percentages may not total 100 because of rounding. Academic research includes basic research and applied research.

¹Data for 1974–76 are the Energy Research and Development Administration; and for 1977–95, the Department of Energy.²See appendix table 4-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *Federal Funds for Research and Development: Fiscal Years 1993, 1994, and 1995, Detailed Statistical Tables*, Volume 43, NSF 95-334 (Arlington, VA: NSF, 1995); and SRS, annual series.

Appendix table 5-10.

Academic research obligations, by major Federal agencies, percent by S&E field: 1993–95 (average)

Field	National Science Foundation	National Aeronautics & Space Admin.	Department of Defense	Department of Energy	Department of Health & Human Svcs.	Department of Agriculture
Total science and engineering	100.0	100.0	100.0	100.0	100.0	100.0
Total sciences.	86.2	79.9	63.9	84.2	99.2	95.9
Physical sciences.	24.7	39.3	12.3	55.8	1.9	5.7
Astronomy.	2.5	14.2	0.5	0.0	0.0	0.0
Chemistry.	7.8	1.2	4.6	9.1	1.8	5.7
Physics.	10.5	19.2	7.0	46.3	0.1	0.0
Other	3.9	4.6	0.1	0.3	0.0	0.0
Mathematical sciences.	5.2	0.1	3.8	1.4	0.1	0.1
Computer sciences	8.3	3.6	20.6	0.8	0.0	0.5
Environmental sciences.	18.2	23.3	10.4	10.2	0.0	1.2
Atmospheric sciences.	4.0	9.3	1.2	4.7	0.0	1.0
Earth sciences.	6.4	4.2	3.5	4.5	0.0	0.3
Oceanography.	4.7	2.3	5.2	0.6	0.0	0.0
Other	3.1	7.6	0.6	0.3	0.0	0.0
Life sciences.	17.3	7.0	10.8	15.1	87.1	76.9
Agricultural sciences.	0.0	0.1	0.0	0.0	0.1	34.9
Biology (excluding environmental).	12.2	3.5	2.4	11.6	44.0	24.4
Environmental biology.	4.5	0.3	3.2	0.1	0.0	15.2
Medical sciences.	0.0	1.5	4.6	3.1	41.5	2.3
Other	0.6	1.7	0.5	0.3	1.6	0.0
Psychology.	0.9	0.8	2.0	0.0	4.6	0.0
Social sciences.	3.1	0.1	1.2	0.0	1.8	11.5
Anthropology.	0.4	0.0	0.0	0.0	0.0	0.0
Economics.	0.8	0.0	0.0	0.0	0.0	9.8
Political science.	0.3	0.0	0.0	0.0	0.0	0.0
Sociology.	0.4	0.0	0.0	0.0	0.4	1.7
Other	1.2	0.0	1.2	0.0	1.4	0.0
Other sciences.	8.2	4.6	2.6	0.9	3.6	0.0
Total engineering	13.8	20.1	36.1	15.8	0.8	4.1
Aeronautical/astronautical.	0.2	7.7	2.7	0.0	0.0	0.0
Chemical.	2.2	0.4	0.6	3.9	0.0	0.0
Civil.	1.6	0.0	0.7	0.6	0.0	0.0
Electrical.	3.3	1.5	11.3	0.5	0.0	0.0
Mechanical.	1.9	2.1	6.1	1.9	0.0	0.0
Materials.	1.4	3.9	11.5	3.7	0.0	0.0
Other	3.2	4.5	3.1	5.3	0.8	4.1

NOTES: Data for 1994 and 1995 are estimates. Research includes both basic and applied research. The six agencies reported are the only ones that report their research obligations to academia by science and engineering field. They represent approximately 97 percent of academic research obligations.

SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *Federal Funds for Research and Development: Fiscal Years 1993, 1994, and 1995*, Detailed Statistical Tables, Volume 43, NSF 95-334 (Arlington, VA: NSF, 1995); and SRS, annual series.

See figure 5-6.

Science & Engineering Indicators – 1996

Appendix table 5-11.

Federal academic research obligations, by S&E field, percent provided by major Federal agencies: 1993–95 (average)

Field	National Science Foundation	National Aeronautics & Space Admin.	Department of Defense	Department of Energy	Department of Health & Human Svcs.	Department of Agriculture
Total science and engineering	16.7	6.1	11.3	5.7	55.9	4.3
Total sciences	15.9	5.4	7.9	5.2	61.0	4.5
Physical sciences.	33.4	19.4	11.2	25.5	8.5	2.0
Astronomy.	31.5	64.1	4.4	0.0	0.0	0.0
Chemistry.	35.6	2.1	14.4	14.2	27.1	6.7
Physics.	27.4	18.3	12.3	40.8	1.1	0.0
Other	67.6	29.2	1.2	1.9	0.0	0.0
Mathematical sciences.	59.3	0.5	29.5	5.3	5.0	0.4
Computer sciences	34.8	5.4	57.9	1.2	0.2	0.5
Environmental sciences	48.5	22.7	18.8	9.2	0.0	0.8
Atmospheric sciences.	40.0	33.6	8.0	15.9	0.0	2.5
Earth sciences.	53.8	12.9	19.8	13.0	0.0	0.6
Oceanography.	50.9	9.2	37.8	2.2	0.0	0.0
Other	48.6	43.4	6.3	1.7	0.0	0.0
Life sciences	5.0	0.7	2.1	1.5	84.8	5.8
Agricultural sciences.	0.0	0.4	0.0	0.2	2.3	97.1
Biology (excluding environmental)	7.1	0.7	1.0	2.3	85.3	3.6
Environmental biology	42.1	0.9	20.1	0.3	0.1	36.6
Medical sciences	0.0	0.4	2.2	0.7	96.3	0.4
Other	8.7	8.9	4.8	1.6	76.0	0.0
Psychology	4.8	1.6	7.4	0.0	86.2	0.0
Social sciences	23.9	0.2	6.2	0.0	46.5	23.1
Anthropology	97.1	0.0	2.8	0.0	0.0	0.1
Economics.	24.0	0.0	0.1	0.0	2.3	73.5
Political science	99.7	0.0	0.0	0.0	0.3	0.0
Sociology	16.8	0.7	0.1	0.0	62.1	20.4
Other	17.8	0.1	12.0	0.0	70.1	0.0
Other sciences.	34.6	7.0	7.3	1.3	49.8	0.0
Total engineering	25.2	13.4	44.5	9.8	5.1	1.9
Aeronautical/astronautical.	3.6	58.8	37.6	0.0	0.0	0.0
Chemical.	53.8	4.0	10.3	32.0	0.0	0.0
Civil	69.5	0.5	21.4	8.6	0.0	0.0
Electrical.	28.3	4.7	65.7	1.3	0.0	0.0
Mechanical	25.7	10.4	55.5	8.4	0.0	0.0
Materials.	11.5	12.0	65.8	10.8	0.0	0.0
Other	25.6	13.0	16.6	14.1	22.3	8.3

NOTES: Data for 1994 and 1995 are estimates. Research includes both basic and applied research. The six agencies reported are the only ones that report their research obligations to academia by science and engineering field. They represent approximately 97 percent of academic research obligations.

SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *Federal Funds for Research and Development: Fiscal Years 1993, 1994, and 1995*, Detailed Statistical Tables, Volume 43, NSF 95-334 (Arlington, VA: NSF, 1995); and SRS, annual series.

See figure 5-7.

Appendix table 5-12.

Square footage of total, new construction, and repair/renovation of academic R&D space, by field: 1986–95

Field	1986–87 actual	1988–89 actual	1990–91 actual	1992–93 actual	1994–95 actual/plan
Thousands of square feet					
Total space					
Total, all fields	NA	112,062	116,327	122,015	127,369
Physical sciences	NA	16,024	16,121	16,353	17,001
Mathematical sciences	NA	722	790	829	937
Computer sciences	NA	1,437	1,445	1,606	1,779
Environmental sciences	NA	6,313	6,056	6,728	7,053
Agricultural sciences	NA	17,622	20,821	19,910	20,120
Biological sciences	NA	23,910	26,154	27,721	27,857
Medical sciences	NA	19,363	19,721	22,374	22,868
Psychology	NA	3,085	2,978	2,984	3,178
Social sciences	NA	3,337	3,338	3,253	3,403
Other sciences	NA	4,350	1,846	2,162	2,442
Engineering	NA	15,900	17,057	18,095	20,730
New construction					
Total, all fields	9,922	10,647	11,433	10,922	11,060
Physical sciences	799	2,000	1,609	1,257	817
Mathematical sciences	9	25	46	44	46
Computer sciences	237	286	293	172	232
Environmental sciences	380	324	529	502	232
Agricultural sciences	1,513	1,146	955	1,218	1,690
Biological sciences	1,708	2,262	2,800	2,189	2,076
Medical sciences	1,948	2,253	2,961	3,823	3,292
Psychology	132	115	164	78	159
Social sciences	202	329	—	221	249
Other sciences	603	418	380	420	206
Engineering	2,390	1,490	1,697	1,065	2,056
Repaired/renovated space					
Total, all fields	13,431	11,449	8,606	9,134	9,219
Physical sciences	1,746	1,928	1,680	1,725	1,605
Mathematical sciences	37	136	39	11	78
Computer sciences	193	144	164	54	200
Environmental sciences	362	930	450	418	194
Agricultural sciences	628	530	391	335	913
Biological sciences	3,611	3,461	2,356	2,169	1,995
Medical sciences	3,236	2,302	2,070	1,962	2,194
Psychology	256	88	254	141	94
Social sciences	181	119	—	236	103
Other sciences	465	180	42	152	49
Engineering	2,716	1,630	1,159	1,932	1,789

NA = not available; — = data included with psychology

NOTES: Data for 2 years are combined—e.g., 1988–89 refers to 2 fiscal years. In the 1986–87 period, data were not reported for total R&D space. Square footage refers to net assignable square footage. Total space is actual space reported. New construction and repair/renovation for 1994 are planned rather than actual space.

SOURCE: Science Resources Studies Division, National Science Foundation, *Scientific and Engineering Research Facilities at Universities and Colleges: 1994*, Volume II, Detailed Statistical Tables, NSF 94-316 (Arlington, VA: NSF, 1994).

See figure 5-9.

Appendix table 5-13.

Cost of academic R&D new construction and repair/renovation projects, by field: 1986–95

Field	1986–87 actual	1988–89 actual	1990–91 actual	1992–93 actual	1994–95 planned	1986–87 actual	1988–89 actual	1990–91 actual	1992–93 actual	1994–95 planned
Total cost in millions of dollars ¹						Cost per square foot in dollars				
New construction										
Total, all fields	2,051	2,464	2,976	2,812	3,020	207	231	260	257	273
Physical sciences	182	401	430	337	364	228	201	267	268	446
Mathematical sciences	2	8	12	10	11	222	320	261	227	239
Computer sciences	61	65	40	47	83	257	227	137	273	358
Environmental sciences	57	82	170	123	55	150	253	321	245	237
Agricultural sciences	150	152	175	210	281	99	133	183	172	166
Biological sciences	463	577	832	633	676	271	255	297	289	326
Medical sciences	505	647	807	999	813	259	287	273	261	247
Psychology	23	25	36	16	50	174	217	220	205	314
Social sciences	38	48	—	44	66	188	146	—	199	265
Other sciences	139	70	79	106	71	231	167	208	252	345
Engineering	430	388	395	286	550	180	260	233	269	268
Repair/renovation										
Total, all fields	838	1,010	826	837	978	62	88	96	92	106
Physical sciences	105	165	151	134	202	60	86	90	78	126
Mathematical sciences	4	11	6	2	8	108	81	154	182	103
Computer sciences	17	9	21	4	23	88	63	128	74	115
Environmental sciences	21	18	16	31	17	58	19	36	74	88
Agricultural sciences	20	23	35	14	79	32	43	90	42	87
Biological sciences	225	201	258	224	226	62	58	110	103	113
Medical sciences	226	185	219	252	241	70	80	106	128	110
Psychology	14	11	31	10	12	55	125	122	71	128
Social sciences	36	8	—	10	14	199	67	—	42	136
Other sciences	30	17	6	7	4	65	94	143	46	82
Engineering	141	361	82	139	152	52	221	71	72	85

— = data included with psychology

NOTES: Data for 2 years are combined—e.g., 1988–89 refers to 2 fiscal years. Square foot refers to net assignable square feet.

¹Project cost estimates are prorated to reflect R&D component only.SOURCE: Science Resources Studies Division, National Science Foundation, *Scientific and Engineering Research Facilities at Universities and Colleges: 1994*, Volume II, Detailed Statistical Tables, NSF 94-316 (Arlington, VA: NSF, 1994).

Appendix table 5-14.

Amount of funds for new construction and repair/renovation of science and engineering research space, by source of funds and type of institutional control: 1986–93

Source of funds and type of institutional control	New construction				Repair/renovation			
	1986–87 actual	1988–89 actual	1990–91 actual	1992–93 actual	1986–87 actual	1988–89 actual	1990–91 actual	1992–93 actual
Millions of dollars								
Total, all institutions	2,050.6	2,464.5	2,975.6	2,810.8	837.9	1,009.5	825.7	835.4
Federal Government	145.4	352.0	476.3	459.3	27.3	61.1	49.0	56.2
State and local government	779.1	890.7	956.6	968.0	233.1	233.8	243.0	252.4
Private donations	487.5	459.2	352.6	301.0	101.0	52.1	100.6	73.0
Institutional funds	289.8	343.8	394.1	374.3	328.0	570.8	355.4	332.0
Tax-exempt bonds	313.1	320.2	727.5	620.3	137.6	69.9	66.4	81.0
Other debt	3.1	95.9	35.4	39.0	3.8	15.9	8.0	27.0
Other	31.9	0.8	33.1	50.0	7.4	5.2	3.2	16.2
Total, public institutions	1,354.8	1,727.0	2,020.0	2,016.4	435.9	698.5	449.3	520.4
Federal Government	40.3	274.3	388.1	325.8	13.2	31.4	24.6	34.3
State and local government	754.5	838.4	809.4	929.8	226.6	229.3	233.5	237.1
Private donations	259.1	192.9	139.1	152.5	15.0	22.0	43.8	24.9
Institutional funds	109.2	256.3	270.2	198.3	155.1	403.5	134.6	154.4
Tax-exempt bonds	189.5	154.4	398.6	390.5	25.5	6.6	12.1	55.9
Other debt	2.4	8.1	7.8	16.2	0.3	4.9	0.0	1.6
Other	0.2	0.6	6.9	3.3	0.2	0.0	0.6	11.9
Total, private institutions	695.8	737.5	955.6	795.5	402.0	311.0	376.4	314.6
Federal Government	105.1	77.7	88.2	133.5	14.1	29.7	24.4	21.8
State and local government	24.6	52.3	147.2	38.8	6.5	4.5	9.5	15.0
Private donations	228.4	266.3	213.5	148.5	86.0	30.1	56.8	47.5
Institutional funds	180.6	87.5	123.9	176.1	172.9	167.3	220.8	176.3
Tax-exempt bonds	123.6	165.7	328.9	229.6	112.1	63.3	54.3	24.5
Other debt	0.7	87.8	27.6	22.7	3.5	11.0	8.0	25.2
Other	31.7	0.2	26.2	46.4	7.2	5.2	2.6	4.3

NOTE: Data for 2 years are combined—e.g., 1988–89 refers to 2 fiscal years.

SOURCE: Science Resources Studies Division, National Science Foundation, *Scientific and Engineering Research Facilities at Universities and Colleges: 1994*, Volume II, Detailed Statistical Tables, NSF 94-316 (Arlington, VA: NSF, 1994).

See figure 5-8.

Science & Engineering Indicators – 1996

Appendix table 5-15.

Distribution of funds for new construction and repair/renovation of science and engineering research space, by source of funds and type of institutional control: 1986–93

Field	New construction				Repair/renovation			
	1986–87 actual	1988–89 actual	1990–91 actual	1992–93 actual	1986–87 actual	1988–89 actual	1990–91 actual	1992–93 actual
Percent								
Total, all institutions								
Federal Government	7.1	14.3	16.0	16.3	3.3	6.1	5.9	6.7
State and local government	38.0	36.1	32.1	34.4	27.8	23.2	29.4	30.2
Private donations	23.8	18.6	11.8	10.7	12.1	5.2	12.2	8.7
Institutional funds	14.1	14.0	13.2	13.3	39.1	56.5	43.0	39.7
Tax-exempt bonds	15.3	13.0	24.4	22.1	16.4	6.9	8.0	9.7
Other debt	0.2	3.9	1.2	1.4	0.5	1.6	1.0	3.2
Other	1.6	0.0	1.1	1.8	0.9	0.5	0.4	1.9
Total, public institutions								
Federal Government	3.0	15.9	19.2	16.2	3.0	4.5	5.5	6.6
State and local government	55.7	48.5	40.1	46.1	52.0	32.8	52.0	45.6
Private donations	19.1	11.2	6.9	7.6	3.4	3.1	9.7	4.8
Institutional funds	8.1	14.8	13.4	9.8	35.6	57.8	30.0	29.7
Tax-exempt bonds	14.0	8.9	19.7	19.4	5.8	0.9	2.7	10.7
Other debt	0.2	0.5	0.4	0.8	0.1	0.7	0.0	0.3
Other	0.0	0.0	0.3	0.2	0.0	0.0	0.1	2.3
Total, private institutions								
Federal Government	15.1	10.5	9.2	16.8	3.5	9.5	6.5	6.9
State and local government	3.5	7.1	15.4	4.9	1.6	1.4	2.5	4.8
Private donations	32.8	36.1	22.3	18.7	21.4	9.7	15.1	15.1
Institutional funds	26.0	11.9	13.0	22.1	43.0	53.8	58.7	56.0
Tax-exempt bonds	17.8	22.5	34.4	28.9	27.9	20.4	14.4	7.8
Other debt	0.1	11.9	2.9	2.9	0.9	3.5	2.1	8.0
Other	4.6	0.0	2.7	5.8	1.8	1.7	0.7	1.4

NOTE: Data for 2 years are combined—e.g., 1988–89 refers to 2 fiscal years.

SOURCE: Science Resources Studies Division, National Science Foundation, *Scientific and Engineering Research Facilities at Universities and Colleges: 1994, Volume II, Detailed Statistical Tables*, NSF 94-316 (Arlington, VA: NSF, 1994).

See figure 5-8.

Appendix table 5-16.

Percentage of total stock of science and engineering research space, by condition and field: 1988–94

Field	Suitable for use in most scientifically sophisticated research				Effective for most use, but not most scientifically sophisticated research				Requires limited repair/renovation to be used effectively				Requires major repair/renovation to be used effectively ¹				Requires replacement	
	1988	1990	1992	1994	1988	1990	1992	1994	1988	1990	1992	1994	1988	1990	1992	1994	1992	1994
Physical sciences	25.7	26.3	29.9	24.8	34.5	33.5	32.5	33.8	22.3	23.7	23.0	23.8	17.5	16.5	12.5	15.3	2.1	2.3
Mathematical sciences	29.5	25.9	30.6	22.6	45.3	44.6	47.1	47.0	19.4	21.9	17.5	24.9	5.8	7.6	3.0	4.1	1.8	1.3
Computer sciences	32.6	38.3	43.9	35.2	35.0	35.5	35.4	40.9	16.2	18.0	13.7	17.9	16.2	8.1	6.0	4.7	1.0	1.2
Environmental sciences	18.7	18.7	22.5	22.1	40.6	40.4	41.9	35.9	26.0	26.1	23.7	22.9	14.7	14.8	9.5	13.0	2.4	6.0
Agricultural sciences	21.2	20.3	16.8	18.2	32.5	33.6	34.3	32.0	26.2	24.1	22.7	27.4	20.0	22.0	18.5	13.6	7.7	8.8
Biological sciences																		
Universities and colleges	23.2	27.5	25.5	22.6	36.2	34.3	32.6	31.0	25.0	24.2	26.7	27.1	15.5	14.0	12.5	14.2	2.8	5.0
Medical schools	36.2	34.3	38.6	36.9	34.0	33.5	30.2	32.2	16.5	18.9	17.4	15.8	13.4	13.2	12.5	13.3	1.4	1.8
Medical sciences																		
Universities and colleges	18.1	24.0	24.4	25.7	40.1	35.1	34.4	34.4	27.2	23.8	24.0	23.3	14.6	17.0	13.8	11.8	3.4	4.7
Medical schools	25.2	28.4	29.7	33.7	35.1	34.4	33.3	29.1	23.1	23.7	22.3	20.5	16.6	13.4	12.6	13.5	2.0	3.3
Psychology	23.2	20.5	22.2	22.8	43.7	46.6	46.9	46.2	20.8	21.4	20.9	26.1	12.3	11.6	9.0	11.1	1.0	2.0
Social sciences	14.8	17.2	17.1	14.4	47.7	45.0	42.8	46.2	26.7	28.1	26.7	28.2	10.8	9.8	12.2	9.0	1.2	1.9
Engineering	26.1	27.9	28.4	31.4	37.6	35.6	36.1	32.3	22.4	22.0	22.2	21.3	13.9	14.5	10.8	12.1	2.4	2.8

¹The data for 1988 and 1990 in this category include space requiring replacement.SOURCE: Science Resources Studies Division, National Science Foundation, *Scientific and Engineering Research Facilities at Universities and Colleges: 1994*, Volume II, Detailed Statistical Tables, NSF 94-316 (Arlington, VA: NSF, 1994).

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Appendix table 5-17.

Adequacy of the amount of science and engineering research space, by field: 1988–94

Field	Total				Adequate				Generally adequate				Inadequate											
	1988	1990	1992	1994	1988	1990	1992	1994	1988	1990	1992	1994	1988	1990	1992	1994								
	Number of institutions																							
Physical sciences	445	450	433	489	4.7	8.7	10.6	6.4	52.4	50.8	52.3	53.1	42.9	40.5	37.0	40.5								
Mathematical sciences	318	296	300	348	21.0	17.6	16.1	16.0	53.6	47.2	58.6	55.5	25.4	35.2	25.3	28.3								
Computer sciences	331	280	297	347	15.1	13.5	12.9	15.5	38.2	41.5	56.7	48.3	46.9	45.0	30.3	36.0								
Environmental sciences	297	284	314	310	11.0	11.1	10.5	7.2	49.4	48.4	59.4	59.6	39.5	40.5	30.1	33.2								
Agricultural sciences	96	94	96	123	11.0	17.0	17.5	10.5	51.2	39.9	48.2	59.7	37.7	43.1	34.3	29.6								
Biological sciences									Percentage of institutions' assessments															
Universities and colleges	444	451	434	490	8.3	8.7	10.8	6.2	45.8	48.2	51.8	53.7	45.9	43.1	37.4	40.1								
Medical schools	91	105	125	132	3.7	10.4	3.6	10.6	47.3	35.5	60.5	53.5	49.0	54.1	35.9	35.5								
Medical sciences																								
Universities and colleges	191	189	210	243	14.3	13.0	14.2	11.7	46.0	40.3	50.1	50.3	39.7	46.7	35.7	38.2								
Medical schools	134	141	146	126	0.8	7.0	4.2	10.8	52.6	33.8	54.1	44.8	46.6	59.2	41.8	44.0								
Psychology	403	398	388	425	16.8	13.2	17.2	14.8	51.4	54.3	50.0	53.9	31.8	32.4	32.9	31.2								
Social sciences	360	345	328	378	12.9	12.7	8.2	7.2	50.2	51.0	64.4	63.4	36.9	36.2	27.4	29.3								
Other sciences	90	69	71	63	10.4	16.9	14.0	15.0	51.3	39.2	44.9	50.0	38.4	44.0	41.1	36.5								
Engineering	283	296	290	297	8.7	10.6	5.8	6.7	40.1	40.8	49.1	53.3	51.1	48.6	45.1	40.5								

SOURCE: Science Resources Studies Division, National Science Foundation, *Scientific and Engineering Research Facilities at Universities and Colleges: 1994*, Volume II, Detailed Statistical Tables, NSF 94-316 (Arlington, VA: NSF, 1994).

Science & Engineering Indicators – 1996

Appendix table 5-18.

Current fund expenditures for research equipment at academic institutions, by field: 1983-93

(page 1 of 2)

Field	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
— Thousands of current dollars —											
Total expenditures											
Total, all fields	450,740	536,793	671,614	782,884	837,000	911,967	986,069	1,012,479	1,023,866	1,032,446	1,037,847
Physical sciences	80,743	103,521	141,836	162,888	166,190	181,410	180,749	191,108	189,391	198,206	205,830
Mathematical sciences	3,741	5,331	6,017	6,827	9,789	9,736	10,261	10,215	10,613	10,205	15,378
Computer sciences	19,945	22,253	35,458	42,590	42,792	42,741	43,009	48,005	58,450	45,013	52,999
Environmental sciences	31,057	41,216	47,791	51,291	55,355	55,789	67,467	72,155	69,733	77,016	75,624
Life sciences	209,284	243,011	282,598	330,601	335,347	379,443	431,024	420,000	411,284	428,785	416,690
Psychology	6,528	7,310	8,703	8,656	10,567	9,579	10,635	10,712	11,068	11,133	15,417
Social sciences	9,462	13,824	10,077	14,082	11,803	11,865	14,482	15,101	14,163	18,043	19,299
Other sciences	10,430	10,318	14,723	20,070	26,831	25,932	26,496	25,077	25,192	19,103	19,235
Engineering	79,550	90,009	124,411	145,879	178,326	195,472	201,946	220,106	233,972	224,942	217,375
Federal expenditures											
Total, all fields	280,610	341,846	432,324	501,298	526,384	576,476	595,368	606,134	610,170	616,844	635,091
Physical sciences	63,660	82,674	113,229	130,487	130,530	142,751	133,180	143,973	139,262	151,540	152,248
Mathematical sciences	2,483	4,088	4,939	5,193	7,596	7,593	6,934	6,722	6,671	6,956	11,341
Computer sciences	14,498	16,853	29,414	35,132	33,932	34,736	30,925	31,571	43,618	29,600	37,202
Environmental sciences	19,163	29,273	32,311	34,972	35,914	36,655	44,586	47,490	42,723	51,598	53,414
Life sciences	114,965	137,271	157,087	188,445	187,842	215,016	237,798	223,364	220,443	229,724	226,291
Psychology	4,547	4,988	6,217	5,851	8,089	6,548	6,938	6,807	7,108	7,067	10,555
Social sciences	3,109	3,894	4,035	4,278	3,456	3,310	4,861	4,918	5,170	7,777	7,756
Other sciences	6,241	5,598	6,793	11,722	13,706	12,057	13,151	11,548	9,640	5,891	8,564
Engineering	51,944	57,207	78,299	85,218	105,319	117,810	116,995	129,741	135,535	126,691	127,720
Nonfederal expenditures											
Total, all fields	170,130	194,947	239,290	281,586	310,616	335,491	390,701	406,345	413,696	415,602	402,756
Physical sciences	17,083	20,847	28,607	32,401	35,660	38,659	47,569	47,135	50,129	46,666	53,582
Mathematical sciences	1,258	1,243	1,078	1,634	2,193	2,143	3,327	3,493	3,942	3,249	4,037
Computer sciences	5,447	5,400	6,044	7,458	8,860	8,005	12,084	16,434	14,832	15,413	15,797
Environmental sciences	11,894	11,943	15,480	16,319	19,441	19,134	22,881	24,665	27,010	25,418	22,210
Life sciences	94,319	105,740	125,511	142,156	147,505	164,427	193,226	196,636	190,841	199,061	190,399
Psychology	1,981	2,322	2,486	2,805	2,478	3,031	3,697	3,905	3,960	4,066	4,862
Social sciences	6,353	9,930	6,042	9,804	8,347	8,555	9,621	10,183	8,993	10,266	11,543
Other sciences	4,189	4,720	7,930	8,348	13,125	13,875	13,345	13,529	15,552	13,212	10,671
Engineering	27,606	32,802	46,112	60,661	73,007	77,662	84,951	90,365	98,437	98,251	89,655

(continued)

Appendix table 5-18.

Current fund expenditures for research equipment at academic institutions, by field: 1983–93

(page 2 of 2)

Field	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
— Thousands of constant 1987 dollars ¹ —											
Total expenditures											
Total, all fields	518,092	590,531	712,210	806,266	837,000	880,277	911,339	903,999	877,349	859,655	843,778
Physical sciences	92,808	113,884	150,409	167,753	166,190	175,106	167,051	170,632	162,289	165,034	167,341
Mathematical sciences	4,300	5,865	6,381	7,031	9,789	9,398	9,483	9,121	9,094	8,497	12,502
Computer sciences	22,925	24,481	37,601	43,862	42,792	41,256	39,750	42,862	50,086	37,480	43,089
Environmental sciences	35,698	45,342	50,680	52,823	55,355	53,850	62,354	64,424	59,754	64,127	61,483
Life sciences	240,556	267,339	299,680	340,475	335,347	366,258	398,359	375,000	352,428	357,023	338,772
Psychology	7,503	8,042	9,229	8,915	10,567	9,246	9,829	9,564	9,484	9,270	12,534
Social sciences	10,876	15,208	10,686	14,503	11,803	11,453	13,384	13,483	12,136	15,023	15,690
Other sciences	11,989	11,351	15,613	20,669	26,831	25,031	24,488	22,390	21,587	15,906	15,638
Engineering	91,437	99,020	131,931	150,236	178,326	188,680	186,641	196,523	200,490	187,296	176,728
Federal expenditures											
Total, all fields	322,540	376,068	458,456	516,270	526,384	556,444	550,248	541,191	522,853	513,609	516,334
Physical sciences	73,172	90,950	120,073	134,384	130,530	137,791	123,087	128,547	119,333	126,178	123,779
Mathematical sciences	2,854	4,497	5,238	5,348	7,596	7,329	6,409	6,002	5,716	5,792	9,220
Computer sciences	16,664	18,540	31,192	36,181	33,932	33,529	28,581	28,188	37,376	24,646	30,246
Environmental sciences	22,026	32,204	34,264	36,016	35,914	35,381	41,207	42,402	36,609	42,963	43,426
Life sciences	132,144	151,013	166,582	194,073	187,842	207,544	219,776	199,432	188,897	191,277	183,976
Psychology	5,226	5,487	6,593	6,026	8,089	6,320	6,412	6,078	6,091	5,884	8,581
Social sciences	3,574	4,284	4,279	4,406	3,456	3,195	4,493	4,391	4,430	6,475	6,306
Other sciences	7,174	6,158	7,204	12,072	13,706	11,638	12,154	10,311	8,260	4,905	6,963
Engineering	59,706	62,934	83,032	87,763	105,319	113,716	108,128	115,840	116,140	105,488	103,837
Nonfederal expenditures											
Total, all fields	195,552	214,463	253,754	289,996	310,616	323,833	361,091	362,808	354,495	346,047	327,444
Physical sciences	19,636	22,934	30,336	33,369	35,660	37,316	43,964	42,085	42,955	38,856	43,563
Mathematical sciences	1,446	1,367	1,143	1,683	2,193	2,069	3,075	3,119	3,378	2,705	3,282
Computer sciences	6,261	5,941	6,409	7,681	8,860	7,727	11,168	14,673	12,710	12,833	12,843
Environmental sciences	13,671	13,139	16,416	16,806	19,441	18,469	21,147	22,022	23,145	21,164	18,057
Life sciences	108,413	116,326	133,098	146,402	147,505	158,713	178,582	175,568	163,531	165,746	154,796
Psychology	2,277	2,554	2,636	2,889	2,478	2,926	3,417	3,487	3,393	3,386	3,953
Social sciences	7,302	10,924	6,407	10,097	8,347	8,258	8,892	9,092	7,706	8,548	9,385
Other sciences	4,815	5,193	8,409	8,597	13,125	13,393	12,334	12,079	13,326	11,001	8,676
Engineering	31,731	36,086	48,899	62,473	73,007	74,963	78,513	80,683	84,350	81,808	72,890

¹See appendix table 4-1 for GDP implicit price deflators used to convert current dollars into constant 1987 dollars.SOURCES: Science Resources Studies Division (SRS), National Science Foundation, *Academic Science and Engineering R&D Expenditures Fiscal Year 1993, Detailed Statistical Tables*, NSF 95-332 (Arlington, VA: NSF, 1995); and SRS, annual series.

See figure 5-10.

Appendix table 5-19.

Academic employment and R&D activity of doctoral scientists and engineers, by field of degree and sex: selected years

Field	Total employment					Active in R&D									
	1979	1981	1989	1991	1993	1979	1981	1989	1991	1993	Number				
											Percent				
Total															
Total science and engineering . . .	154,732	166,496	205,276	209,416	212,862	89,776	100,607	150,885	156,160	149,848	58.0	60.4	73.5	74.6	70.4
Total sciences	138,937	150,355	182,439	186,644	189,719	79,964	91,080	133,227	137,985	132,320	57.6	60.6	73.0	73.9	69.7
Physical sciences	24,580	25,336	27,692	27,682	28,645	15,412	16,297	20,819	20,760	20,028	62.7	64.3	75.2	75.0	69.9
Mathematics	12,186	12,377	14,484	15,226	15,476	6,895	6,817	10,236	10,745	9,517	56.6	55.1	70.7	70.6	61.5
Computer science	80	280	1,494	1,955	2,527	69	271	1,323	1,685	1,998	86.3	96.8	88.6	86.2	79.1
Environmental sciences	4,236	4,564	5,859	6,049	6,436	2,741	3,174	4,917	5,096	5,015	64.7	69.5	83.9	84.2	77.9
Life sciences	46,981	51,320	64,700	66,942	68,193	32,046	37,115	51,711	53,341	51,765	68.2	72.3	79.9	79.7	75.9
Psychology	17,716	20,110	25,003	25,177	24,963	8,256	9,917	14,342	15,689	14,931	46.6	49.3	57.4	62.3	59.8
Social sciences	33,158	36,368	43,207	43,613	43,479	14,545	17,489	29,879	30,669	29,066	43.9	48.1	69.2	70.3	66.9
Engineering	15,795	16,141	22,837	22,774	23,143	9,812	9,527	17,658	18,175	17,528	62.1	59.0	77.3	79.8	75.7
Males															
Total science and engineering . . .	135,513	143,565	167,064	167,969	166,393	79,621	87,155	123,850	126,520	119,363	58.8	60.7	74.1	75.3	71.7
Total sciences	119,872	127,666	144,892	146,167	144,300	69,912	77,806	106,778	109,217	102,611	58.3	60.9	73.7	74.7	71.1
Physical sciences	22,876	23,461	25,219	25,372	25,739	14,496	15,223	19,049	19,143	18,123	63.4	64.9	75.5	75.4	70.4
Mathematics	11,243	11,315	13,022	13,875	13,745	6,421	6,254	9,302	9,792	8,600	57.1	55.3	71.4	70.6	62.6
Computer science	71	255	1,267	1,604	2,061	62	255	1,138	1,401	1,664	87.3	100.0	89.8	87.3	80.7
Environmental sciences	4,040	4,328	5,269	5,370	5,712	2,603	2,986	4,414	4,523	4,465	64.4	69.0	83.8	84.2	78.2
Life sciences	40,046	42,921	49,399	50,112	49,415	27,362	31,048	39,852	40,202	38,294	68.3	72.3	80.7	80.2	77.5
Psychology	13,459	14,877	16,479	15,951	14,701	6,409	7,451	9,440	10,352	9,073	47.6	50.1	57.3	64.9	61.7
Social sciences	28,137	30,509	34,237	33,885	32,928	12,559	14,589	23,583	23,803	22,391	44.6	47.8	68.9	70.2	68.0
Engineering	15,641	15,899	22,172	21,802	22,093	9,709	9,349	17,072	17,303	16,752	62.1	58.8	77.0	79.4	75.8
Females															
Total science and engineering . . .	19,219	22,931	38,212	41,447	46,469	10,155	13,452	27,035	29,640	30,485	52.8	58.7	70.8	71.5	65.6
Total sciences	19,065	22,689	37,547	40,477	45,419	10,052	13,274	26,449	28,768	29,709	52.7	58.5	70.4	71.1	65.4
Physical sciences	1,704	1,875	2,473	2,310	2,906	916	1,074	1,770	1,617	1,905	53.8	57.3	71.6	70.0	65.6
Mathematics	943	1,062	1,462	1,351	1,731	474	563	934	953	917	50.3	53.0	63.9	70.5	53.0
Computer science	—	—	227	351	466	—	—	185	284	334	—	—	81.5	80.9	71.7
Environmental sciences	196	236	590	679	724	138	188	503	573	550	70.4	79.7	85.3	84.4	76.0
Life sciences	6,935	8,399	15,301	16,830	18,778	4,684	6,067	11,859	13,139	13,471	67.5	72.2	77.5	78.1	71.7
Psychology	4,257	5,233	8,524	9,226	10,262	1,847	2,466	4,902	5,337	5,858	43.4	47.1	57.5	57.8	57.1
Social sciences	5,021	5,859	8,970	9,728	10,551	1,986	2,900	6,296	6,866	6,675	39.6	49.5	70.2	70.6	63.3
Engineering	154	242	665	972	1,050	103	178	586	872	776	66.9	73.6	88.1	89.7	73.9

— = small estimate that does not reliably reflect underlying population pattern

NOTES: Excludes university-managed federally funded research and development centers. Because of survey coverage, also excludes scientists and engineers with doctorates from foreign institutions. Field is field of degree as a result of discontinuation of employment field item in 1993 survey. R&D activity reflects respondents' reports of primary and secondary work responsibilities for all years but 1993; for 1993, it refers to the two activities with the largest reported weekly time budgets. R&D management is excluded from R&D because of the unavailability of this item in the 1993 survey.

SOURCES: Science Resources Studies Division, National Science Foundation, *Characteristics of Doctoral Scientists and Engineers, 1993* (Arlington, VA: NSF, forthcoming); and NSF, unpublished tabulations.

See figure 5-12.

Appendix table 5-20.

Academic doctoral scientists and engineers, by position and employment status: 1973–93

	Full-time		Postdoc	Percent with faculty rank
	Faculty	Other		
1973	103,099	4,629	2,936	89.8
1975	116,291	4,530	3,241	89.3
1977	125,459	4,619	3,360	88.9
1979	130,757	9,970	4,510	85.2
1981	141,476	11,580	3,978	85.5
1983	147,779	10,093	6,005	85.8
1985	156,342	16,181	6,504	83.3
1987	163,775	14,876	5,636	84.6
1989	168,815	17,163	6,131	82.9
1991	172,250	16,342	7,292	83.7
1993	171,819	21,983	5,712	80.7

NOTE: Faculty includes ranks of full, associate, and assistant professor, and instructor. Other full-time excludes postdocs.

SOURCES: Science Resources Studies Division, National Science Foundation, *Characteristics of Doctoral Scientists and Engineers, 1993* (Arlington, VA: NSF, forthcoming); and NSF, unpublished tabulations.

See figure 5-11.

Science and Engineering Indicators – 1996

Appendix table 5-21.

Full-time S&E graduate students supported by research assistantships, by source of support and field: 1980–93
(page 1 of 4)

Full-time students	Research assistantships						
	Total	Nonfederal	Federal	Total	Nonfederal	Federal	
	Number			Percent			
Total science and engineering							
1980	238,511	51,572	22,251	29,321	21.6	9.3	12.3
1981	242,155	52,733	23,586	29,147	21.8	9.7	12.0
1982	244,770	52,572	24,259	28,313	21.5	9.9	11.6
1983	252,050	54,896	25,744	29,152	21.8	10.2	11.6
1984	254,021	57,745	28,282	29,463	22.7	11.1	11.6
1985	257,411	61,007	30,574	30,433	23.7	11.9	11.8
1986	266,265	66,026	33,279	32,747	24.8	12.5	12.3
1987	271,150	70,224	35,228	34,996	25.9	13.0	12.9
1988	275,366	74,568	37,826	36,742	27.1	13.7	13.3
1989	282,813	79,006	40,463	38,543	27.9	14.3	13.6
1990	292,958	80,714	42,214	38,500	27.6	14.4	13.1
1991	307,249	85,154	44,372	40,782	27.7	14.4	13.3
1992	322,895	88,006	45,430	42,576	27.3	14.1	13.2
1993	330,249	89,729	45,502	44,227	27.2	13.8	13.4
Total sciences							
1980	195,884	37,654	16,867	20,787	19.2	8.6	10.6
1981	196,431	38,356	17,733	20,623	19.5	9.0	10.5
1982	195,016	37,966	18,217	19,749	19.5	9.3	10.1
1983	198,144	39,352	19,205	20,147	19.9	9.7	10.2
1984	198,856	41,445	20,659	20,786	20.8	10.4	10.5
1985	201,516	43,097	21,097	22,000	21.4	10.5	10.9
1986	206,101	45,608	22,417	23,191	22.1	10.9	11.3
1987	209,219	48,054	23,439	24,615	23.0	11.2	11.8
1988	212,300	51,119	25,312	25,807	24.1	11.9	12.2
1989	218,405	54,413	27,087	27,326	24.9	12.4	12.5
1990	226,960	55,414	28,084	27,330	24.4	12.4	12.0
1991	236,150	58,372	29,474	28,898	24.7	12.5	12.2
1992	248,340	60,470	30,189	30,281	24.3	12.2	12.2
1993	256,287	61,952	30,339	31,613	24.2	11.8	12.3
Physical sciences							
1980	22,917	8,340	1,360	6,980	36.4	5.9	30.5
1981	23,307	8,607	1,336	7,271	36.9	5.7	31.2
1982	24,038	8,768	1,673	7,095	36.5	7.0	29.5
1983	25,204	9,145	1,674	7,471	36.3	6.6	29.6
1984	25,852	9,628	1,821	7,807	37.2	7.0	30.2
1985	26,669	10,284	2,219	8,065	38.6	8.3	30.2
1986	27,762	10,992	2,329	8,663	39.6	8.4	31.2
1987	28,412	11,556	2,684	8,872	40.7	9.4	31.2
1988	28,574	12,056	3,088	8,968	42.2	10.8	31.4
1989	29,207	12,442	3,281	9,161	42.6	11.2	31.4
1990	29,492	12,138	3,292	8,846	41.2	11.2	30.0
1991	30,125	12,230	3,329	8,901	40.6	11.1	29.5
1992	30,675	12,447	3,364	9,083	40.6	11.0	29.6
1993	30,619	12,246	3,113	9,133	40.0	10.2	29.8

(continued)

Appendix table 5-21.

Full-time S&E graduate students supported by research assistantships, by source of support and field: 1980–93
 (page 2 of 4)

	Full-time students	Research assistantships						
		Total	Nonfederal		Federal	Total	Nonfederal	
			Number	Percent			Federal	Percent
Mathematics								
1980	9,901	784	363	421	7.9	3.7	4.3	
1981	10,153	760	420	340	7.5	4.1	3.3	
1982	10,814	845	468	377	7.8	4.3	3.5	
1983	10,957	803	453	350	7.3	4.1	3.2	
1984	11,311	872	461	411	7.7	4.1	3.6	
1985	11,817	998	520	478	8.4	4.4	4.0	
1986	12,390	1,038	500	538	8.4	4.0	4.3	
1987	13,044	1,111	476	635	8.5	3.6	4.9	
1988	13,513	1,226	560	666	9.1	4.1	4.9	
1989	13,683	1,304	642	662	9.5	4.7	4.8	
1990	13,867	1,335	725	610	9.6	5.2	4.4	
1991	14,258	1,356	712	644	9.5	5.0	4.5	
1992	14,681	1,410	726	684	9.6	4.9	4.7	
1993	14,584	1,395	665	730	9.6	4.6	5.0	
Computer sciences								
1980	6,587	1,036	358	678	15.7	5.4	10.3	
1981	7,445	1,098	383	715	14.7	5.1	9.6	
1982	9,171	1,191	428	763	13.0	4.7	8.3	
1983	10,600	1,390	553	837	13.1	5.2	7.9	
1984	11,436	1,613	644	969	14.1	5.6	8.5	
1985	13,861	2,058	988	1,070	14.8	7.1	7.7	
1986	15,020	2,322	1,177	1,145	15.5	7.8	7.6	
1987	15,336	2,817	1,318	1,499	18.4	8.6	9.8	
1988	15,133	3,032	1,390	1,642	20.0	9.2	10.9	
1989	15,606	3,324	1,545	1,779	21.3	9.9	11.4	
1990	16,690	3,334	1,549	1,785	20.0	9.3	10.7	
1991	16,538	3,565	1,610	1,955	21.6	9.7	11.8	
1992	17,498	3,682	1,688	1,994	21.0	9.6	11.4	
1993	17,458	3,747	1,537	2,210	21.5	8.8	12.7	
Environmental sciences								
1980	10,871	3,750	1,058	2,692	34.5	9.7	24.8	
1981	10,934	3,456	1,062	2,394	31.6	9.7	21.9	
1982	11,319	3,327	1,012	2,315	29.4	8.9	20.5	
1983	11,968	3,529	1,187	2,342	29.5	9.9	19.6	
1984	11,734	3,565	1,242	2,323	30.4	10.6	19.8	
1985	11,334	3,707	1,305	2,402	32.7	11.5	21.2	
1986	11,249	3,827	1,459	2,368	34.0	13.0	21.1	
1987	10,435	3,647	1,404	2,243	34.9	13.5	21.5	
1988	10,199	3,880	1,567	2,313	38.0	15.4	22.7	
1989	10,027	4,156	1,677	2,479	41.4	16.7	24.7	
1990	10,262	4,198	1,723	2,475	40.9	16.8	24.1	
1991	10,395	4,399	1,835	2,564	42.3	17.7	24.7	
1992	11,011	4,627	1,743	2,884	42.0	15.8	26.2	
1993	11,403	4,788	1,789	2,999	42.0	15.7	26.3	

(continued)

Appendix table 5-21.

Full-time S&E graduate students supported by research assistantships, by source of support and field: 1980–93
(page 3 of 4)

Full-time students	Research assistantships						
	Total	Nonfederal	Federal	Total	Nonfederal	Federal	
	Number			Percent			
Life sciences							
1980	71,859	15,896	8,266	7,630	22.1	11.5	10.6
1981	71,686	16,349	8,750	7,599	22.8	12.2	10.6
1982	69,714	16,243	8,942	7,301	23.3	12.8	10.5
1983	69,338	16,495	9,226	7,269	23.8	13.3	10.5
1984	69,976	17,575	10,177	7,398	25.1	14.5	10.6
1985	69,592	17,895	9,896	7,999	25.7	14.2	11.5
1986	70,559	19,228	10,657	8,571	27.3	15.1	12.1
1987	71,245	20,199	10,828	9,371	28.4	15.2	13.2
1988	72,915	21,588	11,501	10,087	29.6	15.8	13.8
1989	75,257	23,163	12,209	10,954	30.8	16.2	14.6
1990	77,482	23,922	12,723	11,199	30.9	16.4	14.5
1991	81,873	25,810	13,632	12,178	31.5	16.7	14.9
1992	85,912	26,781	13,949	12,832	31.2	16.2	14.9
1993	91,648	28,036	14,468	13,568	30.6	15.8	14.8
Psychology							
1980	26,671	2,567	1,625	942	9.6	6.1	3.5
1981	26,570	2,887	1,851	1,036	10.9	7.0	3.9
1982	25,667	2,723	1,796	927	10.6	7.0	3.6
1983	26,561	2,959	2,015	944	11.1	7.6	3.6
1984	25,969	3,024	2,062	962	11.6	7.9	3.7
1985	25,335	3,070	2,053	1,017	12.1	8.1	4.0
1986	26,255	3,101	2,080	1,021	11.8	7.9	3.9
1987	27,256	3,227	2,149	1,078	11.8	7.9	4.0
1988	28,224	3,722	2,512	1,210	13.2	8.9	4.3
1989	29,478	3,852	2,574	1,278	13.1	8.7	4.3
1990	30,791	4,079	2,740	1,339	13.2	8.9	4.3
1991	32,443	4,262	2,816	1,446	13.1	8.7	4.5
1992	34,350	4,324	2,885	1,439	12.6	8.4	4.2
1993	34,953	4,500	2,986	1,514	12.9	8.5	4.3
Social sciences							
1980	47,078	5,281	3,837	1,444	11.2	8.2	3.1
1981	46,336	5,199	3,931	1,268	11.2	8.5	2.7
1982	44,293	4,869	3,898	971	11.0	8.8	2.2
1983	43,516	5,031	4,097	934	11.6	9.4	2.1
1984	42,578	5,168	4,252	916	12.1	10.0	2.2
1985	42,908	5,085	4,116	969	11.9	9.6	2.3
1986	42,866	5,100	4,215	885	11.9	9.8	2.1
1987	43,491	5,497	4,580	917	12.6	10.5	2.1
1988	43,742	5,615	4,694	921	12.8	10.7	2.1
1989	45,147	6,172	5,159	1,013	13.7	11.4	2.2
1990	48,376	6,408	5,332	1,076	13.2	11.0	2.2
1991	50,518	6,750	5,540	1,210	13.4	11.0	2.4
1992	54,213	7,199	5,834	1,365	13.3	10.8	2.5
1993	55,622	7,240	5,781	1,459	13.0	10.4	2.6

(continued)

Appendix table 5-21.

Full-time S&E graduate students supported by research assistantships, by source of support and field: 1980–93
 (page 4 of 4)

	Full-time students	Research assistantships						
		Total	Nonfederal		Federal	Total	Nonfederal	
			Number	Percent			Federal	
Engineering								
1980	42,627	13,918	5,384	8,534	32.7	12.6	20.0	
1981	45,724	14,377	5,853	8,524	31.4	12.8	18.6	
1982	49,754	14,606	6,042	8,564	29.4	12.1	17.2	
1983	53,906	15,544	6,539	9,005	28.8	12.1	16.7	
1984	55,165	16,300	7,623	8,677	29.5	13.8	15.7	
1985	55,895	17,910	9,477	8,433	32.0	17.0	15.1	
1986	60,164	20,418	10,862	9,556	33.9	18.1	15.9	
1987	61,931	22,170	11,789	10,381	35.8	19.0	16.8	
1988	63,066	23,449	12,514	10,935	37.2	19.8	17.3	
1989	64,408	24,593	13,376	11,217	38.2	20.8	17.4	
1990	65,998	25,300	14,130	11,170	38.3	21.4	16.9	
1991	71,099	26,782	14,898	11,884	37.7	21.0	16.7	
1992	74,555	27,536	15,241	12,295	36.9	20.4	16.5	
1993	73,962	27,777	15,163	12,614	37.6	20.5	17.1	

S&E = science and engineering

 SOURCES: Science Resources Studies Division, National Science Foundation, *Academic Science and Engineering: Graduate Enrollment and Support, 1993* (Arlington, VA: NSF, forthcoming); and NSF, unpublished tabulations.

See figure 5-13.

Science and Engineering Indicators – 1996

Appendix table 5-22.

Distribution of graduate research assistants, by field and source of support: 1980–93

	Total sciences	Physical sciences	Mathematics	Computer sciences	Environmental sciences	Life sciences	Psychology	Social sciences	Engineering
	Percent								
	All sources								
1980	73.0	16.2	1.5	2.0	7.3	30.8	5.0	10.2	27.0
1981	72.7	16.3	1.4	2.1	6.6	31.0	5.5	9.9	27.3
1982	72.2	16.7	1.6	2.3	6.3	30.9	5.2	9.3	27.8
1983	71.7	16.7	1.5	2.5	6.4	30.0	5.4	9.2	28.3
1984	71.8	16.7	1.5	2.8	6.2	30.4	5.2	8.9	28.2
1985	70.6	16.9	1.6	3.4	6.1	29.3	5.0	8.3	29.4
1986	69.1	16.6	1.6	3.5	5.8	29.1	4.7	7.7	30.9
1987	68.4	16.5	1.6	4.0	5.2	28.8	4.6	7.8	31.6
1988	68.6	16.2	1.6	4.1	5.2	29.0	5.0	7.5	31.4
1989	68.9	15.7	1.7	4.2	5.3	29.3	4.9	7.8	31.1
1990	68.7	15.0	1.7	4.1	5.2	29.6	5.1	7.9	31.3
1991	68.5	14.4	1.6	4.2	5.2	30.3	5.0	7.9	31.5
1992	68.7	14.1	1.6	4.2	5.3	30.4	4.9	8.2	31.3
1993	69.0	13.6	1.6	4.2	5.3	31.2	5.0	8.1	31.0
Nonfederal sources									
1980	75.8	6.1	1.6	1.6	4.8	37.1	7.3	17.2	24.2
1981	75.2	5.7	1.8	1.6	4.5	37.1	7.8	16.7	24.8
1982	75.1	6.9	1.9	1.8	4.2	36.9	7.4	16.1	24.9
1983	74.6	6.5	1.8	2.1	4.6	35.8	7.8	15.9	25.4
1984	73.0	6.4	1.6	2.3	4.4	36.0	7.3	15.0	27.0
1985	69.0	7.3	1.7	3.2	4.3	32.4	6.7	13.5	31.0
1986	67.4	7.0	1.5	3.5	4.4	32.0	6.3	12.7	32.6
1987	66.5	7.6	1.4	3.7	4.0	30.7	6.1	13.0	33.5
1988	66.9	8.2	1.5	3.7	4.1	30.4	6.6	12.4	33.1
1989	66.9	8.1	1.6	3.8	4.1	30.2	6.4	12.7	33.1
1990	66.5	7.8	1.7	3.7	4.1	30.1	6.5	12.6	33.5
1991	66.4	7.5	1.6	3.6	4.1	30.7	6.3	12.5	33.6
1992	66.5	7.4	1.6	3.7	3.8	30.7	6.4	12.8	33.5
1993	66.7	6.8	1.5	3.4	3.9	31.8	6.6	12.7	33.3
Federal sources									
1980	70.9	23.8	1.4	2.3	9.2	26.0	3.2	4.9	29.1
1981	70.8	24.9	1.2	2.5	8.2	26.1	3.6	4.4	29.2
1982	69.8	25.1	1.3	2.7	8.2	25.8	3.3	3.4	30.2
1983	69.1	25.6	1.2	2.9	8.0	24.9	3.2	3.2	30.9
1984	70.5	26.5	1.4	3.3	7.9	25.1	3.3	3.1	29.5
1985	72.3	26.5	1.6	3.5	7.9	26.3	3.3	3.2	27.7
1986	70.8	26.5	1.6	3.5	7.2	26.2	3.1	2.7	29.2
1987	70.3	25.4	1.8	4.3	6.4	26.8	3.1	2.6	29.7
1988	70.2	24.4	1.8	4.5	6.3	27.5	3.3	2.5	29.8
1989	70.9	23.8	1.7	4.6	6.4	28.4	3.3	2.6	29.1
1990	71.0	23.0	1.6	4.6	6.4	29.1	3.5	2.8	29.0
1991	70.9	21.8	1.6	4.8	6.3	29.9	3.5	3.0	29.1
1992	71.1	21.3	1.6	4.7	6.8	30.1	3.4	3.2	28.9
1993	71.5	20.7	1.7	5.0	6.8	30.7	3.4	3.3	28.5

SOURCES: Science Resources Studies Division, National Science Foundation, *Academic Science and Engineering: Graduate Enrollment and Support, 1993* (Arlington, VA: NSF, forthcoming); and NSF, unpublished tabulations.

See figure 5-14.

Appendix table 5-23.

Teaching and research indicators of full-time doctoral science and engineering faculty, by primary activity and type of institution: 1993
 (page 1 of 3)

Major activity	All students			Undergraduates			Graduate students			Articles published	Division of time		
	All faculty	Total taught	Hours taught	Total TAs	Total taught	Hours taught	Total TAs	Total taught	Hours taught	Total TAs	Teaching	Research	
	Number										Percent		
All academic institutions													
All faculty	174,875	12,015,252	1,141,238	123,686	9,371,725	862,499	95,930	2,494,089	262,123	26,140	606,611	43.5	31.6
Teaching	91,676	8,365,593	865,049	78,057	7,181,898	721,650	65,000	1,106,193	134,027	12,095	180,117	65.0	16.1
Research ²	64,514	3,094,276	223,357	40,313	1,840,023	113,764	28,160	1,188,465	103,720	11,648	378,910	22.7	59.3
Other	18,684	555,382	52,831	5,315	349,805	27,085	2,770	199,431	24,375	2,397	47,584	10.0	12.3
All faculty who taught undergraduates													
Teaching	108,610	10,006,887	970,027	101,059	9,371,725	862,499	95,930	587,493	101,522	4,240	273,840	55.6	22.9
Research	24,560	1,995,620	141,601	29,933	1,840,023	113,764	28,160	147,969	26,895	1,773	125,816	32.2	49.3
Other	6,088	375,389	30,445	2,831	349,805	27,085	2,770	24,577	3,240	0	13,701	16.9	11.6
All faculty who did not teach any undergraduate courses													
Teaching	66,265	2,008,364	171,211	22,627	NA	NA	NA	1,906,595	160,601	21,900	332,771	23.6	45.9
Research	39,955	1,098,657	81,756	10,380	NA	NA	NA	1,040,496	76,825	9,875	253,094	16.9	65.4
Other	12,596	179,993	22,386	2,485	NA	NA	NA	174,854	21,136	2,397	33,882	6.8	12.9
Research universities													
All faculty	84,718	4,971,089	353,251	75,572	3,533,517	204,757	57,937	1,393,057	145,063	17,233	407,784	33.3	41.7
Teaching	29,249	2,631,639	195,477	39,803	2,100,549	131,680	32,096	530,932	63,673	7,706	96,799	57.9	22.8
Research	45,951	2,132,476	141,278	33,045	1,285,213	66,727	23,992	807,916	72,364	8,717	281,148	22.7	59.6
Other	9,517	206,973	16,497	2,725	147,755	6,350	1,849	54,209	9,026	810	29,838	9.1	14.0
All faculty who taught undergraduates													
Teaching	39,897	3,830,196	253,801	61,244	3,533,517	204,757	57,937	292,749	48,529	3,307	157,664	45.3	33.4
Research	16,491	1,391,197	85,625	25,618	1,285,213	66,727	23,992	102,187	18,482	1,626	83,864	32.1	49.4
Other	2,284	157,737	7,054	1,849	147,755	6,350	1,849	9,983	704	0	9,573	15.0	12.9
All faculty who did not teach any undergraduate courses													
Teaching	44,821	1,140,893	99,450	14,328	NA	NA	NA	1,100,308	96,534	13,926	250,121	22.6	49.2
Research	29,460	741,280	55,652	7,427	NA	NA	NA	705,729	53,882	7,091	197,283	17.4	65.2
Other	7,233	49,235	9,443	876	NA	NA	NA	44,226	8,322	810	20,265	7.2	14.3

(continued)

Appendix table 5-23.

Teaching and research indicators of full-time doctoral science and engineering faculty, by primary activity and type of institution: 1993
(page 2 of 3)

Major activity	All faculty	All students			Undergraduates			Graduate students			Division of time		
		Total taught	Hours taught	Total TAs	Total taught	Hours taught	Total TAs	Total taught	Hours taught	Total TAs	Articles published	Teaching	
Number										Percent			
Other academic institutions													
All faculty	90,157	7,044,163	787,987	48,114	5,838,208	657,816	37,993	1,101,032	117,060	8,907	198,827	53.1 22.1	
Teaching	62,427	5,733,954	669,572	38,255	5,081,349	590,044	32,903	575,260	70,354	4,389	83,318	68.3 13.0	
Research	18,563	961,800	82,080	7,268	554,810	47,037	4,168	380,549	31,357	2,931	97,763	22.8 58.6	
Other	9,167	348,409	36,335	2,591	202,050	20,735	921	145,222	15,349	1,588	17,746	11.0 10.6	
All faculty who taught undergraduates													
undergraduates	68,714	6,176,692	716,226	39,815	5,838,208	657,668	37,993	294,744	52,993	933	116,177	61.6 16.9	
Teaching	56,841	5,354,617	636,859	34,519	5,081,349	589,896	32,903	234,368	42,045	786	70,097	68.7 12.8	
Research	8,069	604,423	55,976	4,315	554,810	47,037	4,168	45,782	8,413	147	41,952	32.3 49.0	
Other	3,804	217,651	23,391	981	202,050	20,735	921	14,594	2,536	0	4,128	17.7 10.1	
All faculty who did not teach any undergraduate courses													
any undergraduate courses	21,444	867,471	71,761	8,299	NA	NA	NA	806,288	64,067	7,974	82,650	25.7 38.9	
Teaching	5,586	379,336	32,714	3,736	NA	NA	NA	340,892	28,310	3,603	13,221	63.7 14.9	
Research	10,494	357,377	26,104	2,953	NA	NA	NA	334,767	22,944	2,784	55,811	15.4 65.9	
Other	5,363	130,758	12,943	1,609	NA	NA	NA	130,628	12,814	1,588	13,618	6.2 10.9	
Per faculty average										Percent			
All academic institutions													
All faculty	174,875	68.7	6.5	0.7	53.6	4.9	0.5	14.3	1.5	0.1	3.5	43.5 31.6	
Teaching	91,676	91.3	9.4	0.9	78.3	7.9	0.7	12.1	1.5	0.1	2.0	65.0 16.1	
Research	64,514	48.0	3.5	0.6	28.5	1.8	0.4	18.4	1.6	0.2	5.9	22.7 59.3	
Other	18,684	29.7	2.8	0.3	18.7	1.4	0.1	10.7	1.3	0.1	2.5	10.0 12.3	
All faculty who taught undergraduates													
undergraduates	108,610	92.1	8.9	0.9	86.3	7.9	0.9	5.4	0.9	0.0	2.5	55.6 22.9	
Teaching	77,963	97.9	10.2	0.9	92.1	9.3	0.8	5.3	0.9	0.0	1.7	66.1 15.5	
Research	24,560	81.3	5.8	1.2	74.9	4.6	1.1	6.0	1.1	0.1	5.1	32.2 49.3	
Other	6,088	61.7	5.0	0.5	57.5	4.4	0.5	4.0	0.5	0.0	2.3	16.9 11.6	
All faculty who did not teach any undergraduate courses													
any undergraduate courses	66,265	30.3	2.6	0.3	NA	NA	NA	28.8	2.4	0.3	5.0	23.6 45.9	
Teaching	13,714	53.2	4.9	0.7	NA	NA	NA	50.4	4.6	0.7	3.3	58.8 19.2	
Research	39,955	27.5	2.0	0.3	NA	NA	NA	26.0	1.9	0.2	6.3	16.9 65.4	
Other	12,596	14.3	1.8	0.2	NA	NA	NA	13.9	1.7	0.2	2.7	6.8 12.9	

(continued)

Appendix table 5-23.

Teaching and research indicators of full-time doctoral science and engineering faculty, by primary activity and type of institution: 1993
 (page 3 of 3)

Major activity	All students			Undergraduates			Graduate students			Articles published	Division of time		
	All faculty	Total taught	Hours taught	Total TAs	Total taught	Hours taught	Total TAs	Total taught	Hours taught	Total TAs	Teaching	Research	
— Per faculty average —										— Percent —			
Research universities													
All faculty	84,718	58.7	4.2	0.9	41.7	2.4	0.7	16.4	1.7	0.2	4.8	33.3	41.7
Teaching	29,249	90.0	6.7	1.4	71.8	4.5	1.1	18.2	2.2	0.3	3.3	57.9	22.8
Research	45,951	46.4	3.1	0.7	28.0	1.5	0.5	17.6	1.6	0.2	6.1	22.7	59.6
Other	9,517	21.7	1.7	0.3	15.5	0.7	0.2	5.7	0.9	0.1	3.1	9.1	14.0
All faculty who taught undergraduates	39,897	96.0	6.4	1.5	88.6	5.1	1.5	7.3	1.2	0.1	4.0	45.3	33.4
Teaching	21,122	108.0	7.6	1.6	99.4	6.2	1.5	8.5	1.4	0.1	3.0	58.9	23.0
Research	16,491	84.4	5.2	1.6	77.9	4.0	1.5	6.2	1.1	0.1	5.1	32.1	49.4
Other	2,284	69.1	3.1	0.8	64.7	2.8	0.8	4.4	0.3	0.0	4.2	15.0	12.9
All faculty who did not teach any undergraduate courses	44,821	25.5	2.2	0.3	NA	NA	NA	24.5	2.2	0.3	5.6	22.6	49.2
Teaching	8,127	43.1	4.2	0.7	NA	NA	NA	43.1	4.2	0.7	4.0	55.3	22.2
Research	29,460	25.2	1.9	0.3	NA	NA	NA	24.0	1.8	0.2	6.7	17.4	65.2
Other	7,233	6.8	1.3	0.1	NA	NA	NA	6.1	1.2	0.1	2.8	7.2	14.3
Other academic institutions													
All faculty	90,157	78.1	8.7	0.5	64.8	7.3	0.4	12.2	1.3	0.1	2.2	53.1	22.1
Teaching	62,427	91.9	10.7	0.6	81.4	9.5	0.5	9.2	1.1	0.1	1.3	68.3	13.0
Research	18,563	51.8	4.4	0.4	29.9	2.5	0.2	20.5	1.7	0.2	5.3	22.8	58.6
Other	9,167	38.0	4.0	0.3	22.0	2.3	0.1	15.8	1.7	0.2	1.9	11.0	10.6
All faculty who taught undergraduates	68,714	89.9	10.4	0.6	85.0	9.6	0.6	4.3	0.8	0.0	1.7	61.6	16.9
Teaching	56,841	94.2	11.2	0.6	89.4	10.4	0.6	4.1	0.7	0.0	1.2	68.7	12.8
Research	8,069	74.9	6.9	0.5	68.8	5.8	0.5	5.7	1.0	0.0	5.2	32.3	49.0
Other	3,804	57.2	6.1	0.3	53.1	5.5	0.2	3.8	0.7	0.0	1.1	17.7	10.1
All faculty who did not teach any undergraduate courses	21,444	40.5	3.3	0.4	NA	NA	NA	37.6	3.0	0.4	3.9	25.7	38.9
Teaching	5,586	67.9	5.9	0.7	NA	NA	NA	61.0	5.1	0.6	2.4	63.7	14.9
Research	10,494	34.1	2.5	0.3	NA	NA	NA	31.9	2.2	0.3	5.3	15.4	65.9
Other	5,363	24.4	2.4	0.3	NA	NA	NA	24.4	2.4	0.3	2.5	6.2	10.9

¹Reflects number of articles published over 2-year period.²Respondents who reported spending half or more of their time on research, plus those whose research time exceeded that spent on teaching, if the sum of these functions exceeded 60 percent of weekly work time.

SOURCE: National Center for Education Statistics, National Study of Postsecondary Faculty, 1993; and NSF, special tabulations.

Appendix table 5-24.

Full-time academic doctoral science and engineering faculty, by field of degree and primary work responsibility: 1973–93

Field	1973	1975	1977	1979	1981	1983	1985	1987	1989	1991	1993
Percent											
Teaching											
Total science and engineering	68.8	70.5	63.3	61.1	65.4	62.4	61.3	57.0	55.5	55.8	52.9
Total sciences	65.3	66.3	60.6	58.3	61.0	59.5	56.8	54.1	50.9	51.1	48.7
Physical science	75.3	74.8	66.0	64.2	69.6	65.6	64.4	61.0	59.8	59.3	55.7
Mathematics	78.4	80.3	75.3	73.1	75.9	74.5	71.1	69.6	67.2	68.0	67.9
Computer science	—	—	—	66.1	62.7	48.9	35.2	39.3	38.2	58.2	57.0
Environmental science	75.3	78.2	72.8	68.4	72.9	67.5	69.1	63.3	60.2	62.7	56.0
Life science	54.4	56.3	49.6	46.2	48.5	45.5	43.5	38.9	38.3	37.4	36.3
Psychology	67.9	72.9	64.8	62.0	67.2	63.5	63.4	62.7	59.3	58.8	53.7
Social science	76.2	78.5	71.3	70.8	76.9	75.7	75.6	70.4	67.7	70.6	65.7
Engineering	72.9	72.5	63.8	62.7	68.1	63.9	64.0	57.2	57.8	59.0	54.7
Research											
Total science and engineering	19.4	18.8	21.0	21.6	22.7	22.8	25.6	29.7	30.6	31.2	33.1
Total sciences	25.8	25.2	28.3	29.7	30.8	30.9	32.9	37.4	37.8	37.7	40.9
Physical science	17.2	18.2	22.2	22.0	22.7	22.4	26.5	29.8	30.1	31.0	33.4
Mathematics	15.4	12.6	14.6	15.9	15.3	14.7	19.6	21.3	23.8	22.7	21.2
Computer science	—	—	—	33.9	32.6	41.1	59.6	52.0	54.9	32.3	35.9
Environmental science	15.7	14.9	17.9	16.6	21.6	23.0	22.1	28.9	32.8	32.0	35.0
Life science	32.1	32.1	33.1	35.3	38.5	38.3	41.5	46.4	46.2	46.7	47.5
Psychology	14.8	11.8	14.9	15.5	15.2	16.9	17.9	20.2	22.6	24.0	27.1
Social science	11.6	10.9	12.9	11.6	11.6	11.3	13.2	17.1	18.6	18.4	23.0
Engineering	13.6	14.2	16.9	18.0	18.6	18.6	21.1	26.0	26.8	27.6	30.0
Other											
Total science and engineering	11.8	10.7	15.7	17.4	11.9	14.8	13.1	13.3	13.9	13.0	14.0
Total sciences	8.9	8.5	11.1	12.0	8.2	9.5	10.3	8.5	11.4	11.2	10.4
Physical science	7.5	7.0	11.8	13.8	7.7	12.0	9.1	9.2	10.1	9.7	10.9
Mathematics	6.2	7.1	10.1	11.0	8.8	10.8	9.3	9.1	9.0	9.4	10.9
Computer science	—	—	—	0.0	4.7	10.0	5.2	8.7	6.9	9.5	7.1
Environmental science	8.9	6.9	9.4	15.0	5.5	9.6	8.8	7.7	7.0	5.3	9.0
Life science	13.5	11.6	17.2	18.5	13.0	16.2	15.0	14.7	15.5	15.8	16.3
Psychology	17.2	15.3	20.3	22.5	17.6	19.6	18.7	17.1	18.2	17.2	19.2
Social science	12.2	10.6	15.8	17.6	11.5	13.0	11.2	12.5	13.7	11.0	11.3
Engineering	13.5	13.3	19.3	19.4	13.2	17.6	14.8	16.8	15.4	13.5	15.3

— = There were no academic scientists and engineers with computer science degrees in 1973–77.

NOTES: Research includes basic and applied research, development, and design but excludes management of R&D, which is unavailable for 1993 and has been included with Other for all years. Faculty includes full, associate, and assistant professors, plus instructors. A small number with unreported primary work responsibility have been excluded. Data was first reported for computer science as a separate discipline in 1979.

SOURCES: Science Resources Studies Division, National Science Foundation, *Characteristics of Doctoral Scientists & Engineers, 1993* (Arlington, VA: NSF, forthcoming); and NSF, unpublished tabulations.

See figures 5-16 and 5-17.

Appendix table 5-25.

Employment share, and share among researchers, of females, underrepresented minorities, and Asians: selected years

Field	Females					Underrepresented minorities					Asians						
	1979	1981	1989	1991	1993	1979	1981	1989	1991	1993	1979	1981	1989	1991	1993		
Percent																	
Employment																	
Total science and engineering	12.4	13.8	18.6	19.8	21.8	3.2	3.5	4.4	4.8	5.1	6.4	6.6	8.0	8.0	9.9		
Total sciences	13.7	15.1	20.6	21.7	23.9	3.3	3.7	4.6	4.9	5.2	5.7	6.1	6.7	7.0	8.6		
Physical sciences	6.9	7.4	8.9	8.3	10.1	2.9	3.5	4.0	4.6	5.2	7.6	7.9	10.1	9.4	13.2		
Mathematics	7.7	8.6	10.1	8.9	11.2	3.4	3.3	4.0	3.5	4.3	7.3	7.2	8.9	10.6	12.1		
Computer science	—	—	15.2	18.0	18.4	—	—	4.1	4.4	5.8	—	—	20.8	25.4	30.3		
Environmental sciences	4.6	5.2	10.1	11.2	11.2	1.3	1.6	2.3	1.5	2.3	2.9	3.4	4.6	4.2	5.7		
Life sciences	14.8	16.4	23.6	25.1	27.5	2.9	3.1	3.8	3.9	4.1	6.6	7.1	7.4	7.6	9.3		
Psychology	24.0	26.0	34.1	36.6	41.1	3.1	4.2	5.3	5.9	6.3	1.6	2.0	2.1	2.1	2.1		
Social sciences	15.1	16.1	20.8	22.3	24.3	4.4	4.7	6.2	6.9	7.0	4.9	5.6	5.4	5.8	6.1		
Engineering	1.0	1.5	2.9	4.3	4.5	2.4	1.7	3.1	3.9	4.0	12.3	10.9	17.8	16.1	20.2		
Researchers																	
Total science and engineering	11.3	13.4	17.9	19.0	20.3	2.8	3.0	4.1	4.5	4.8	7.8	8.0	9.5	9.5	11.8		
Total sciences	12.6	14.6	19.9	20.8	22.5	2.9	3.2	4.3	4.5	4.9	6.6	7.4	8.0	8.3	10.1		
Physical sciences	5.9	6.6	8.5	7.8	9.5	2.5	3.2	3.9	4.5	4.8	9.2	9.5	11.8	11.0	16.3		
Mathematics	6.9	8.3	9.1	8.9	9.6	2.9	3.1	4.0	3.1	3.8	7.9	7.4	10.9	12.2	14.1		
Computer science	—	—	14.0	16.9	16.7	—	—	4.7	5.0	7.2	—	—	21.0	29.4	36.3		
Environmental sciences	5.0	5.9	10.2	11.2	11.0	1.2	2.0	2.4	1.4	2.4	3.6	3.9	5.0	4.8	5.9		
Life sciences	14.6	16.3	22.9	24.6	26.0	3.0	2.9	3.8	3.6	3.8	7.5	8.5	8.3	8.6	10.7		
Psychology	22.4	24.9	34.2	34.0	39.2	2.4	3.2	4.5	4.6	5.9	1.8	2.9	2.6	2.6	2.5		
Social sciences	13.7	16.6	21.1	22.4	23.0	3.9	4.0	5.9	7.0	7.2	4.3	6.0	6.1	7.0	6.4		
Engineering	1.0	1.9	3.3	4.8	4.4	1.9	1.5	2.7	4.1	3.9	18.1	14.3	21.2	18.6	24.0		

— = Small estimate that does not reliably reflect underlying population pattern.

SOURCES: Science Resources Studies Division, National Science Foundation, *Characteristics of Doctoral Scientists and Engineers, 1993* (Arlington, VA: NSF, forthcoming); and NSF, unpublished tabulations.

Science and Engineering Indicators – 1996

Appendix table 5-26.

Academic employment and R&D activity of doctoral scientists and engineers, by race/ethnicity and field of degree: 1979-93
(page 1 of 2)

Field	Total employment					Active in R&D					Active in R&D				
	1979	1981	1989	1991	1993	1979	1981	1989	1991	1993	1979	1981	1989	1991	1993
Number															
Total science and engineering	154,732	166,496	205,276	209,414	212,862	89,776	100,607	150,885	156,159	149,853	58.0	60.4	73.5	74.6	70.4
White	141,629	151,693	183,711	186,433	185,434	81,254	90,896	133,383	137,360	128,204	57.4	59.9	72.6	73.7	69.1
Asian	9,835	10,925	16,334	16,811	21,013	7,027	8,078	14,359	14,869	17,609	71.4	73.9	87.9	88.4	83.8
Black	1,946	2,567	3,728	4,594	4,833	752	869	2,187	2,855	2,929	38.6	33.9	58.7	62.1	60.6
Hispanic	2,335	2,503	4,268	4,497	4,958	1,459	1,679	3,406	3,552	3,575	62.5	67.1	79.8	79.0	72.1
Native American	630	748	1,046	895	1,028	329	473	652	566	725	52.2	63.2	62.3	63.2	70.5
Total sciences	138,937	150,355	182,439	186,641	189,719	79,964	91,080	133,227	137,983	132,325	57.6	60.6	73.0	73.9	69.7
White	127,910	137,535	165,267	167,884	167,414	73,271	82,846	119,683	123,030	115,197	57.3	60.2	72.4	73.3	68.8
Asian	7,897	9,171	12,276	13,137	16,340	5,254	6,714	10,616	11,486	13,397	66.5	73.2	86.5	87.4	82.0
Black	1,895	2,455	3,463	4,188	4,522	739	834	2,013	2,511	2,683	39.0	34.0	58.1	60.0	59.3
Hispanic	2,028	2,374	3,881	4,071	4,430	1,290	1,604	3,131	3,185	3,189	63.6	67.6	80.7	78.2	72.0
Native American	614	714	996	833	940	322	441	629	529	677	52.4	61.8	63.2	63.5	72.0
Physical sciences	24,580	25,336	27,692	27,682	28,644	15,412	16,297	20,819	20,759	20,029	62.7	64.3	75.2	75.0	69.9
White	22,150	22,727	24,232	24,423	24,029	13,730	14,448	17,942	17,990	16,251	62.0	63.6	74.0	73.7	67.6
Asian	1,876	1,991	2,789	2,615	3,785	1,411	1,542	2,465	2,288	3,271	75.2	77.4	88.4	87.5	86.4
Black	199	312	347	361	533	82	119	247	270	323	41.2	38.1	71.2	74.8	60.6
Hispanic	356	417	596	764	780	234	301	495	594	562	65.7	72.2	83.1	77.7	72.1
Native American	169	169	157	139	182	75	97	78	67	84	44.4	57.4	49.7	48.2	46.2
Mathematics	12,186	12,377	14,484	15,224	15,475	6,895	6,817	10,236	10,743	9,517	56.6	55.1	70.7	70.6	61.5
White	11,013	11,188	12,968	13,364	13,250	6,159	6,178	8,959	9,308	7,967	55.9	55.2	69.1	69.6	60.1
Asian	887	890	1,295	1,614	1,873	548	506	1,117	1,309	1,344	61.8	56.9	86.3	81.1	71.8
Black	167	168	182	166	227	74	80	129	78	153	44.3	47.6	70.9	47.0	67.4
Hispanic	236	239	373	372	396	121	129	265	250	196	51.3	54.0	71.0	67.2	49.5
Native American	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Computer science	80	280	1,494	1,954	2,527	69	271	1,323	1,685	1,999	86.3	96.8	88.6	86.2	79.1
White	59	229	1,170	1,400	1,708	57	220	1,032	1,133	1,239	96.6	96.1	88.2	80.9	72.5
Asian	311	497	766	278	495	726	-	-	-	-	-	-	89.4	99.6	94.8
Black	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hispanic	-	-	54	-	111	-	-	54	-	107	-	-	-	-	96.4
Native American	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(continued)

Appendix table 5-26.

Academic employment and R&D activity of doctoral scientists and engineers, by race/ethnicity and field of degree: 1979–93
(page 2 of 2)

Field	Total employment					Active in R&D					Active in R&D				
	1979	1981	1989	1991	1993	1979	1981	1989	1991	1993	1979	1981	1989	1991	1993
	Number										Percent				
Environmental science	4,236	4,564	5,859	6,049	6,435	2,741	3,174	4,917	5,096	5,015	64.7	69.5	83.9	84.2	77.9
White	4,093	4,378	5,548	5,774	6,016	2,627	3,035	4,634	4,837	4,684	64.2	69.3	83.5	83.8	77.9
Asian	121	155	268	254	364	98	124	244	244	294	81.0	80.0	91.0	96.1	80.8
Black	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hispanic	54	65	104	80	112	—	56	89	70	99	—	86.2	85.6	87.5	88.4
Native American	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Life science	46,981	51,320	64,700	66,942	68,194	32,046	37,115	51,711	53,342	51,767	68.2	72.3	79.9	79.7	75.9
White	43,031	46,828	58,625	60,332	60,227	29,136	33,457	46,471	47,698	45,157	67.7	71.4	79.3	79.1	75.0
Asian	3,098	3,635	4,760	5,085	6,359	2,414	3,149	4,315	4,593	5,547	77.9	86.6	90.7	90.3	87.2
Black	575	606	1,013	1,192	1,295	300	329	698	786	806	52.2	54.3	68.9	65.9	62.2
Hispanic	673	831	1,244	1,234	1,292	573	632	1,100	1,019	982	85.1	76.1	88.4	82.6	76.0
Native American	98	144	188	169	213	91	113	143	132	177	92.9	78.5	76.1	78.1	83.1
Psychology	17,716	20,110	25,003	25,177	24,964	8,256	9,917	14,342	15,689	14,932	46.6	49.3	57.4	62.3	59.8
White	16,972	19,080	23,555	23,568	23,342	7,957	9,442	13,543	14,782	13,964	46.9	49.5	57.5	62.7	59.8
Asian	284	407	514	532	522	149	286	380	411	366	52.5	70.3	73.9	77.3	70.1
Black	291	429	714	851	895	88	116	310	413	427	30.2	27.0	43.4	48.5	47.7
Hispanic	161	290	461	517	572	—	148	268	265	371	—	51.0	58.1	51.3	64.9
Native American	94	129	141	120	118	60	—	68	—	87	63.8	—	48.2	—	73.7
Social science	33,158	36,368	43,207	43,613	43,480	14,545	17,489	29,879	30,669	29,066	43.9	48.1	69.2	70.3	66.8
White	30,592	33,105	39,169	39,023	38,842	13,605	16,066	27,102	27,282	25,935	44.5	48.5	69.2	69.9	66.8
Asian	1,611	2,043	2,339	2,540	2,671	623	1,057	1,817	2,146	1,849	38.7	51.7	77.7	84.5	69.2
Black	662	938	1,184	1,570	1,500	194	188	610	923	920	29.3	20.0	51.5	58.8	61.3
Hispanic	548	529	1,049	1,067	1,167	280	335	860	950	872	51.1	63.3	82.0	89.0	74.7
Native American	243	260	467	393	388	91	172	305	278	314	37.4	66.2	65.3	70.7	80.9
Engineering	15,795	16,141	22,837	22,773	23,143	9,812	9,527	17,658	18,176	17,528	62.1	59.0	77.3	79.8	75.7
White	13,719	14,158	18,444	18,549	18,020	7,983	8,050	13,700	14,330	13,007	58.2	56.9	74.3	77.3	72.2
Asian	1,938	1,754	4,058	3,674	4,673	1,773	1,364	3,743	3,383	4,212	91.5	77.8	92.2	92.1	90.1
Black	51	112	265	406	311	—	—	174	344	246	—	—	65.7	84.7	79.1
Hispanic	307	129	387	426	528	169	75	275	367	386	55.0	58.1	71.1	86.2	73.1
Native American	—	—	50	62	88	—	—	—	—	—	—	—	—	—	—

— = small estimate that does not reliably reflect underlying population pattern

NOTES: Numbers in this table reflect the composition of survey respondents, by field of degree, whose race/ethnicity, sex, and primary and secondary work responsibilities are known. Numbers are weighted estimates from sample surveys. Details do not add to total because (a) racial and ethnic categories are not mutually exclusive, i.e., Hispanics may also be included in one of the racial groups, and (b) totals include those in "other" and "no report" categories, which are not shown separately.

SOURCES: Science Resources Studies Division, National Science Foundation, *Characteristics of Doctoral Scientists and Engineers, 1993* (Arlington, VA: NSF, forthcoming); and NSF, unpublished tabulations.

Science and Engineering Indicators – 1996

Appendix table 5-27.

Percentage of academic doctoral scientists and engineers reporting Federal support: 1979–93

Field	1979	1981	1983	1985	1987	1989	1991	1993
Total science and engineering ...	41	43	46	38	49	50	51	38
Computer science	35	30	42	46	62	53	50	41
Engineering	51	52	57	44	59	58	65	43
Environmental sciences	48	51	56	52	61	64	67	52
Life sciences	56	60	62	54	66	65	66	53
Mathematics	23	23	33	23	32	35	36	21
Physical sciences	44	52	52	44	55	59	58	47
Psychology	32	33	30	26	31	36	35	27
Social sciences	21	23	25	18	27	28	29	15

NOTES: Percentages are based on respondents who answered "yes" or "no" to question whether they received Federal Government support. Data for 1985 and 1993, which specified reference periods of 1 month and 1 week, respectively, are not comparable with other years, which asked about support during the entire academic year.

SOURCES: Science Resources Studies Division, National Science Foundation, *Characteristics of Doctoral Scientists and Engineers*, 1993 (Arlington, VA: NSF, forthcoming); and NSF, unpublished tabulations.

See figure 5-18.

Science and Engineering Indicators – 1996

Appendix table 5-28.

Percentage of Government-supported scientists and engineers who obtained funding from more than one Federal agency: 1979–93

Field	1979	1981	1983	1985	1987	1989	1991	1993
Total science and engineering ...	18	19	20	18	26	26	30	25
Total sciences	17	18	19	18	25	25	29	24
Physical sciences	23	24	26	22	32	31	37	32
Mathematics sciences	14	17	11	16	22	26	25	20
Computer science	—	14	28	22	35	37	42	42
Environmental sciences	27	37	42	38	45	46	52	45
Life sciences	15	16	18	16	24	24	26	19
Psychology	14	19	16	16	16	19	20	19
Social sciences	12	14	11	11	21	16	27	24
Engineering	28	25	28	24	34	37	40	36

— = small estimate that does not reliably reflect underlying population pattern

NA = not available

NOTE: Percentages are based on respondents who reported receiving support from the Federal Government.

SOURCES: Science Resources Studies Division, National Science Foundation, *Characteristics of Doctoral Scientists and Engineers*, 1993 (Arlington, VA: NSF, forthcoming); and NSF, unpublished tabulations.

Science and Engineering Indicators – 1996

Appendix table 5-29.

Cumulative age distribution of full-time academic doctoral science and engineering faculty: 1973–93

Age	1973	1975	1977	1979	1981	1983	1985	1987	1989	1991	1993
Mean	42.4	42.8	43.3	44.0	44.7	45.5	45.8	46.6	47.1	47.0	46.9
Median	40.3	40.6	41.0	41.7	42.4	43.4	43.9	45.1	46.0	46.4	46.0
Cumulative percent											
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
27	0.5	0.5	0.3	0.2	0.1	0.2	0.1	0.1	0.1	0.0	0.2
28	1.5	1.2	0.9	0.7	0.6	0.4	0.3	0.3	0.1	0.4	0.5
29	3.6	2.9	2.3	1.7	1.5	1.1	1.0	0.7	0.5	0.8	1.1
30	7.1	5.0	4.5	3.4	3.2	2.2	1.9	1.3	1.4	1.5	2.1
31	11.8	8.2	7.1	5.9	5.1	3.7	3.5	2.8	2.4	2.7	3.4
32	16.5	12.8	10.0	9.1	7.5	6.2	5.5	4.3	3.8	4.4	4.9
33	21.3	18.1	14.0	12.6	10.8	8.6	7.9	6.5	6.1	6.5	6.9
34	25.6	22.9	19.2	16.1	14.6	11.3	10.8	9.2	8.3	8.8	9.3
35	30.3	27.7	25.0	20.0	18.2	14.7	13.9	11.9	10.8	11.7	11.9
36	34.6	32.3	29.7	25.1	21.9	18.7	17.0	15.2	13.6	14.6	15.1
37	38.3	36.8	34.5	30.3	25.7	22.5	20.7	18.1	16.7	17.4	18.2
38	41.9	41.0	38.6	34.9	30.3	26.0	24.8	21.5	20.4	20.7	21.4
39	45.5	44.5	42.9	39.5	35.2	29.8	29.1	25.1	23.5	23.7	24.7
40	49.0	47.9	46.8	43.4	39.7	34.4	32.9	28.9	26.9	27.1	28.0
41	52.5	51.4	50.2	47.7	44.1	39.7	36.6	33.2	30.6	30.7	31.4
42	55.9	54.7	53.2	51.2	48.2	44.0	41.3	37.0	34.5	34.2	34.7
43	59.1	58.0	56.2	54.6	52.3	48.4	46.0	40.7	38.6	37.6	38.3
44	62.1	61.1	59.3	57.3	55.7	52.4	50.4	45.1	42.0	41.5	41.8
45	65.2	64.2	62.4	60.2	58.8	56.1	54.5	49.5	45.6	45.5	45.5
46	68.0	67.0	65.4	63.2	61.3	59.3	58.1	54.0	49.9	48.6	49.9
47	70.4	70.0	68.2	65.9	64.0	62.3	61.7	58.0	54.4	52.1	53.0
48	73.1	72.6	71.0	68.7	66.9	64.7	64.8	61.8	58.8	56.4	56.3
49	75.8	74.9	73.6	71.4	69.5	67.5	67.4	65.2	62.8	60.8	60.2
50	78.3	77.2	76.1	73.8	71.9	70.2	69.9	68.3	66.2	65.0	64.6
51	80.7	79.7	78.3	76.5	74.6	72.7	72.4	71.1	69.5	69.0	68.8
52	82.9	82.0	80.5	79.0	76.8	75.1	74.9	73.4	72.4	72.2	72.6
53	85.0	84.1	82.8	80.9	79.3	77.7	77.3	75.8	75.1	75.5	75.5
54	86.7	86.2	85.0	83.2	81.5	79.9	79.4	78.3	77.4	78.3	78.6
55	88.5	88.2	86.9	85.5	83.4	82.4	81.8	80.6	79.6	80.6	80.9
56	89.9	88.7	88.9	87.5	85.5	84.6	83.7	82.7	82.0	82.7	83.5
57	91.3	91.2	90.7	89.3	87.6	86.4	85.8	85.0	84.2	84.9	85.3
58	92.6	92.4	92.0	91.0	89.5	88.3	87.7	86.9	86.3	87.2	87.1
59	93.8	93.7	93.4	92.5	91.0	90.2	89.2	88.9	88.5	89.3	89.2
60	94.8	94.7	94.6	93.7	92.6	92.0	90.9	90.8	90.2	91.1	90.8
61	95.8	95.8	95.7	95.0	94.1	93.4	92.7	92.3	92.1	93.1	92.5
62	96.7	96.7	96.7	96.1	95.2	94.9	94.1	93.8	93.7	94.4	94.3
63	97.5	97.5	97.5	97.1	96.4	96.2	95.3	95.3	95.1	95.7	95.4
64	98.0	98.2	98.3	98.0	97.3	97.2	96.5	96.5	96.2	96.6	96.7
65	98.7	98.8	98.9	98.6	98.2	98.1	97.6	97.3	97.3	97.6	97.5
66	99.1	99.1	99.3	99.2	98.8	98.7	98.3	98.2	98.0	98.3	98.1
67	99.5	99.4	99.5	99.5	99.2	99.2	98.8	98.9	98.6	98.9	98.7
68	99.7	99.7	99.7	99.7	99.6	99.6	99.3	99.2	99.1	99.4	99.1
69	99.8	99.8	99.8	99.8	99.8	99.8	99.7	99.6	99.5	99.7	99.5
70	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.7	99.8	99.8
71	100.0	100.0	100.0	100.0	99.9	100.0	100.0	99.9	99.9	99.9	99.9
72	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	100.0
73	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
74	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
75	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NOTE: Faculty is defined as full, associate, and assistant professors, plus instructors with full-time appointments.

SOURCES: Science Resources Studies Division, National Science Foundation, *Characteristics of Doctoral Scientists and Engineers, 1993* (Arlington, VA: NSF, forthcoming); and NSF, unpublished tabulations.

See figures 5-19, 5-20, and 5-21.

Appendix table 5-30.

World articles, by field and subfield: 1981 and 1993

Field and subfields	1981	1993	Field and subfields	1981	1993
Clinical medicine	118,363	130,957	Biology	36,423	33,555
Addictive diseases	492	658	Agricultural and food sciences	9,745	7,931
Allergy	671	797	Botany	10,015	9,582
Anesthesiology	1,163	1,871	Dairy and animal science	2,444	2,509
Arthritis and rheumatism	980	1,216	Ecology	2,699	2,516
Cancer	5,506	7,649	Entomology	2,961	2,322
Cardiovascular system	4,130	5,538	Marine- and hydrobiology	3,514	4,294
Dentistry	2,274	2,530	General and misc biology	1,361	1,232
Dermatology and venereal diseases	2,502	2,906	General and misc zoology	3,684	3,169
Endocrinology	4,221	4,821			
Fertility	1,307	1,468	Chemistry	52,768	58,218
Gastroenterology	1,895	2,903	Analytical chemistry	6,543	6,860
General, internal, and misc medicine	18,726	14,017	Applied chemistry	1,651	1,328
Geriatrics	722	776	Inorganic and nuclear chemistry	4,449	5,118
Hematology	2,328	3,076	Organic chemistry	8,720	9,220
Hygiene and public health	1,703	2,168	Physical chemistry	11,798	14,953
Immunology	7,799	10,402	Polymers	4,636	6,043
Nephrology	573	885	General chemistry	14,971	14,696
Neurology and neurosurgery	10,392	13,795			
Obstetrics and gynecology	2,160	2,693	Physics	48,242	63,789
Ophthalmology	2,421	2,548	Acoustics	1,363	1,285
Orthopedics	1,176	1,304	Applied physics	11,506	15,995
Otorhinolaryngology	1,607	1,996	Chemical physics	5,831	7,646
Pathology	2,764	3,204	Fluids and plasmas	1,001	748
Pediatrics	2,958	3,282	Nuclear and particle physics	4,562	7,990
Pharmacology	12,604	13,222	Optics	2,101	3,673
Pharmacy	2,538	2,114	Solid state physics	6,205	9,200
Psychiatry	2,281	2,452	General and misc physics	15,673	17,252
Radiology & nucl med	5,199	5,366			
Respiratory system	1,383	2,216	Earth and space sciences	17,909	20,983
Surgery	5,449	5,281	Astronomy and astrophysics	4,118	4,963
Tropical medicine	838	966	Earth & planetary sciences	5,545	5,863
Urology	1,795	2,294	Environmental sciences	3,356	4,386
Veterinary medicine	5,806	4,543	Geology	2,638	2,834
			Meteorology and atmos sciences	1,254	1,567
Biomedical research	60,358	68,914	Oceanography and limnology	998	1,370
Anatomy and morphology	778	807			
Biochemistry and molecular biology	20,577	25,099	Engineering and technology	25,716	29,014
Biomedical engineering	1,355	2,291	Aerospace technology	920	916
Biophysics	1,021	1,093	Chemical engineering	2,833	3,158
Cell biology and histology	4,701	4,231	Civil engineering	754	918
Embryology	550	815	Computers	1,522	1,759
Genetics and heredity	4,060	5,617	Electrical eng and electronics	6,077	6,595
Microbiology	4,263	5,681	Library and information science	113	21
Microscopy	431	438	Materials science	2,549	4,427
Nutrition and dietetics	1,781	1,363	Mechanical engineering	2,963	3,493
Parasitology	1,260	1,249	Metals and metallurgy	3,746	4,500
Physiology	3,652	5,691	Nuclear technology	2,679	1,876
Virology	1,999	2,896	General and misc engineering	1,560	1,351
General and misc biomedical research	13,930	11,643			
			Mathematics	10,152	8,151
			Applied mathematics	1,756	1,773
			Probability and statistics	1,670	1,238
			General and misc mathematics	6,726	5,140

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF special tabulations.

Appendix table 5-31.
World and U.S. scientific and technical articles, by field: 1981–93

Region and field	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Number of articles													
World													
Clinical medicine	116,371	118,186	119,325	119,094	125,532	126,463	124,975	125,787	130,106	129,843	130,107	133,913	130,957
Biomedical research	55,303	57,203	57,289	56,223	64,717	64,550	64,216	65,257	68,616	68,769	69,205	71,502	68,914
Biology	39,232	39,025	37,788	38,093	34,896	34,127	32,775	33,426	34,199	35,626	34,233	34,559	33,555
Chemistry	54,432	55,381	54,186	54,117	55,268	55,558	53,236	55,679	56,126	57,723	56,731	59,500	58,218
Physics	45,561	47,229	46,902	46,450	54,044	54,056	53,377	60,757	61,449	60,799	60,758	66,960	63,789
Earth and space sciences . . .	16,991	16,660	16,508	16,334	17,834	18,351	18,285	17,490	18,714	18,902	19,509	20,926	20,983
Engineering and technology . .	30,710	28,602	32,073	30,310	28,004	26,201	24,344	25,461	25,442	26,670	27,618	29,684	29,014
Mathematics	10,334	9,474	9,478	9,309	9,551	7,722	7,105	9,168	9,193	7,282	7,393	8,302	8,151
Number of articles													
United States													
Clinical medicine	48,072	48,530	48,055	48,735	50,595	50,637	49,904	49,931	50,510	50,322	50,142	50,326	50,258
Biomedical research	21,847	22,732	22,496	22,196	24,461	24,765	24,542	25,072	26,541	26,660	26,918	27,782	27,120
Biology	14,740	14,974	14,216	14,166	13,083	13,000	12,231	12,370	12,726	13,182	12,862	12,062	11,304
Chemistry	10,880	11,758	11,010	11,137	11,585	12,313	11,827	12,384	12,405	12,718	13,086	12,926	13,252
Physics	13,053	13,255	13,021	12,691	15,903	16,360	16,078	17,499	17,649	17,241	18,077	17,847	16,912
Earth and space sciences . . .	7,257	7,057	6,862	6,748	7,663	7,811	7,797	7,653	7,770	7,716	8,138	8,233	8,522
Engineering and technology . .	12,486	11,619	13,105	11,976	10,822	9,775	9,225	9,488	9,568	10,113	9,999	10,833	10,051
Mathematics	3,943	3,697	3,648	3,462	3,659	3,109	2,893	3,745	3,664	3,040	3,111	3,165	3,170
Percent													
United States world share													
Clinical medicine	41.3	41.1	40.3	40.9	40.3	40.0	39.9	39.7	38.8	38.8	38.5	37.6	38.4
Biomedical research	39.5	39.7	39.3	39.5	37.8	38.4	38.2	38.4	38.7	38.8	38.9	38.9	39.4
Biology	37.6	38.4	37.6	37.2	37.5	38.1	37.3	37.0	37.2	37.0	37.6	34.9	33.7
Chemistry	20.0	21.2	20.3	20.6	21.0	22.2	22.2	22.2	22.1	22.0	23.1	21.7	22.8
Physics	28.6	28.1	27.8	27.3	29.4	30.3	30.1	28.8	28.7	28.4	29.8	26.7	26.5
Earth and space sciences . . .	42.7	42.4	41.6	41.3	43.0	42.6	42.6	43.8	41.5	40.8	41.7	39.3	40.6
Engineering and technology . .	40.7	40.6	40.9	39.5	38.6	37.3	37.9	37.3	37.6	37.9	36.2	36.5	34.6
Mathematics	38.2	39.0	38.5	37.2	38.3	40.3	40.7	40.8	39.9	41.7	42.1	38.1	38.9

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF special tabulations.

See figure 5-24.

Science and Engineering Indicators – 1996

Appendix table 5-32.

Scientific and technical articles, by country and field: 1981–93

(page 1 of 7)

Field	Article publication year													
	Number							Percent						
	1981	1983	1985	1987	1989	1991	1993	1981	1983	1985	1987	1989	1991	1993
United States														
All fields	132,279	132,415	137,771	134,497	140,833	142,333	140,588	35.9	35.4	35.3	35.6	34.9	35.1	33.6
Clinical medicine.....	48,072	48,055	50,595	49,904	50,510	50,142	50,258	41.3	40.3	40.3	39.9	38.8	38.5	38.4
Biomedical research	21,847	22,496	24,461	24,542	26,541	26,918	27,120	39.5	39.3	37.8	38.2	38.7	38.9	39.4
Biology	14,740	14,216	13,083	12,231	12,726	12,862	11,304	37.6	37.6	37.5	37.3	37.2	37.6	33.7
Chemistry	10,880	11,010	11,585	11,827	12,405	13,086	13,252	20.0	20.3	21.0	22.2	22.1	23.1	22.8
Physics	13,053	13,021	15,903	16,078	17,649	18,077	16,912	28.6	27.8	29.4	30.1	28.7	29.8	26.5
Earth and space sciences ...	7,257	6,862	7,663	7,797	7,770	8,138	8,522	42.7	41.6	43.0	42.6	41.5	41.7	40.6
Engineering and technology..	12,486	13,105	10,822	9,225	9,568	9,999	10,051	40.7	40.9	38.6	37.9	37.6	36.2	34.6
Mathematics.....	3,943	3,648	3,659	2,893	3,664	3,111	3,170	38.2	38.5	38.3	40.7	39.9	42.1	38.9
United Kingdom														
All fields	30,794	31,199	32,256	30,304	30,572	30,528	31,375	8.3	8.4	8.3	8.0	7.6	7.5	7.5
Clinical medicine.....	11,378	11,865	13,228	12,523	12,956	12,856	12,843	9.8	9.9	10.5	10.0	10.0	9.9	9.8
Biomedical research	4,709	5,017	5,301	4,902	5,043	5,232	5,259	8.5	8.8	8.2	7.6	7.3	7.6	7.6
Biology	3,525	3,422	3,087	2,888	2,654	2,375	2,460	9.0	9.1	8.8	8.8	7.8	6.9	7.3
Chemistry	3,610	3,405	3,287	3,215	3,142	3,311	3,473	6.6	6.3	5.9	6.0	5.6	5.8	6.0
Physics	2,904	2,839	3,026	3,004	3,048	3,039	3,275	6.4	6.1	5.6	5.6	5.0	5.0	5.1
Earth and space sciences ...	1,441	1,433	1,475	1,326	1,420	1,397	1,638	8.5	8.7	8.3	7.3	7.6	7.2	7.8
Engineering and technology..	2,596	2,580	2,197	1,834	1,782	1,852	1,948	8.5	8.0	7.8	7.5	7.0	6.7	6.7
Mathematics.....	631	638	655	612	526	465	478	6.1	6.7	6.9	8.6	5.7	6.3	5.9
Germany														
All fields	26,835	26,093	27,310	25,865	27,353	27,486	27,902	7.3	7.0	7.0	6.8	6.8	6.8	6.7
Clinical medicine.....	8,180	8,152	8,169	7,784	8,239	7,979	8,146	7.0	6.8	6.5	6.2	6.3	6.1	6.2
Biomedical research	3,915	4,091	3,963	4,092	4,358	4,313	4,207	7.1	7.1	6.1	6.4	6.4	6.2	6.1
Biology	2,372	1,960	1,889	1,829	1,817	1,827	1,553	6.0	5.2	5.4	5.6	5.3	5.3	4.6
Chemistry	4,587	4,408	5,139	4,668	4,864	4,944	5,180	8.4	8.1	9.3	8.8	8.7	8.7	8.9
Physics	3,493	3,812	4,316	4,320	4,832	4,963	5,346	7.7	8.1	8.0	8.1	7.9	8.2	8.4
Earth and space sciences ...	833	807	913	837	851	905	1,002	4.9	4.9	5.1	4.6	4.5	4.6	4.8
Engineering and technology..	2,321	2,170	2,167	1,861	1,786	2,039	1,940	7.6	6.8	7.7	7.6	7.0	7.4	6.7
Mathematics.....	1,134	692	752	475	606	516	528	11.0	7.3	7.9	6.7	6.6	7.0	6.5

(continued)

Appendix table 5-32.

Scientific and technical articles, by country and field: 1981–93

(page 2 of 7)

Field	Article publication year													
	Number						Percent							
	1981	1983	1985	1987	1989	1991	1993	1981	1983	1985	1987	1989	1991	1993
France														
All fields	18,568	17,805	18,421	18,283	19,754	19,271	21,572	5.0	4.8	4.7	4.8	4.9	4.8	5.2
Clinical medicine.	6,070	5,630	5,356	5,645	5,865	5,854	6,208	5.2	4.7	4.3	4.5	4.5	4.5	4.7
Biomedical research	2,883	2,799	3,251	3,204	3,423	3,501	3,795	5.2	4.9	5.0	5.0	5.0	5.1	5.5
Biology	1,369	1,268	1,151	1,054	1,164	1,140	1,267	3.5	3.4	3.3	3.2	3.4	3.3	3.8
Chemistry	3,199	2,825	3,260	3,123	3,231	3,306	3,514	5.9	5.2	5.9	5.9	5.8	5.8	6.0
Physics	2,671	2,969	3,218	3,190	3,590	3,211	3,749	5.9	6.3	6.0	6.0	5.8	5.3	5.9
Earth and space sciences . . .	774	747	681	875	834	871	1,011	4.6	4.5	3.8	4.8	4.5	4.5	4.8
Engineering and technology..	1,020	977	843	835	961	1,051	1,332	3.3	3.0	3.0	3.4	3.8	3.8	4.6
Mathematics	581	591	661	356	686	337	696	5.6	6.2	6.9	5.0	7.5	4.6	8.5
Italy														
All fields	7,803	8,879	9,376	9,045	10,719	11,276	12,241	2.1	2.4	2.4	2.4	2.7	2.8	2.9
Clinical medicine.	2,715	3,142	3,608	3,589	4,045	4,377	4,465	2.3	2.6	2.9	2.9	3.1	3.4	3.4
Biomedical research	1,109	1,306	1,378	1,207	1,535	1,621	1,839	2.0	2.3	2.1	1.9	2.2	2.3	2.7
Biology	451	429	345	379	424	465	543	1.1	1.1	1.0	1.2	1.2	1.4	1.6
Chemistry	1,462	1,654	1,518	1,458	1,631	1,662	1,812	2.7	3.1	2.7	2.7	2.9	2.9	3.1
Physics	1,150	1,396	1,513	1,487	1,819	1,815	2,105	2.5	3.0	2.8	2.8	3.0	3.0	3.3
Earth and space sciences . . .	349	329	319	333	440	522	587	2.1	2.0	1.8	1.8	2.4	2.7	2.8
Engineering and technology..	428	464	472	355	533	575	628	1.4	1.4	1.7	1.5	2.1	2.1	2.2
Mathematics.	138	159	224	236	293	239	263	1.3	1.7	2.3	3.3	3.2	3.2	3.2
Other Southern Europe														
All fields	4,212	5,003	6,086	7,070	8,186	9,250	10,905	1.1	1.3	1.6	1.9	2.0	2.3	2.6
Clinical medicine.	990	1,074	1,150	1,516	1,818	2,264	2,627	0.9	0.9	0.9	1.2	1.4	1.7	2.0
Biomedical research	741	798	990	1,277	1,323	1,535	1,608	1.3	1.4	1.5	2.0	1.9	2.2	2.3
Biology	356	362	408	527	702	836	1,088	0.9	1.0	1.2	1.6	2.1	2.4	3.2
Chemistry	997	1,419	1,838	1,767	1,899	2,012	2,473	1.8	2.6	3.3	3.3	3.4	3.5	4.2
Physics	571	713	937	1,035	1,252	1,378	1,668	1.3	1.5	1.7	1.9	2.0	2.3	2.6
Earth and space sciences . . .	145	148	192	311	390	456	578	0.9	0.9	1.1	1.7	2.1	2.3	2.8
Engineering and technology..	287	320	349	459	518	578	706	0.9	1.0	1.2	1.9	2.0	2.1	2.4
Mathematics.	125	169	221	179	284	194	283	1.2	1.8	2.3	2.5	3.1	2.6	3.5

(continued)

Appendix table 5-32.
Scientific and technical articles, by country and field: 1981–93
 (page 3 of 7)

Field	Article publication year											
	Number						Percent					
	Nordic countries											
All fields	13,135	13,939	14,450	14,108	14,535	14,457	14,963	3.6	3.7	3.7	3.6	3.6
Clinical medicine.....	6,836	7,513	7,766	7,528	7,461	7,006	7,047	5.9	6.3	6.2	5.8	5.4
Biomedical research.....	2,105	2,113	2,350	2,298	2,491	2,502	2,529	3.8	3.7	3.6	3.6	3.6
Biology	1,022	1,070	981	969	1,118	1,192	1,260	2.6	2.8	2.8	3.0	3.5
Chemistry	1,064	936	1,057	1,068	1,054	1,111	1,274	2.0	1.7	1.9	2.0	2.2
Physics	928	1,053	1,056	1,120	1,176	1,226	1,456	2.0	2.3	2.0	1.9	2.0
Earth and space sciences ...	350	357	524	512	531	660	624	2.1	2.2	3.0	2.8	3.1
Engineering and technology..	586	672	499	447	503	617	592	1.9	2.1	1.8	2.0	2.0
Mathematics.....	245	224	214	166	202	143	182	2.4	2.4	2.3	2.2	1.9
Other Western Europe												
All fields	16,995	17,383	18,253	17,615	19,032	19,431	20,736	4.6	4.7	4.7	4.7	4.8
Clinical medicine.....	6,505	6,915	7,158	7,113	7,870	7,693	8,212	5.6	5.8	5.7	5.7	5.9
Biomedical research.....	2,577	2,714	3,044	2,951	3,197	3,437	3,692	4.7	4.7	4.7	4.6	5.0
Biology	1,378	1,431	1,399	1,236	1,371	1,279	1,497	3.5	3.8	4.0	3.8	4.5
Chemistry	2,311	2,099	2,228	2,185	2,161	2,398	2,550	4.2	3.9	4.0	4.1	4.2
Physics	2,216	2,254	2,476	2,508	2,656	2,733	2,848	4.9	4.8	4.6	4.7	4.5
Earth and space sciences ...	543	549	706	637	665	680	865	3.2	3.3	4.0	3.5	3.5
Engineering and technology..	1,060	1,032	850	678	727	854	966	3.5	3.2	3.0	2.8	3.1
Mathematics.....	408	392	395	308	382	359	343	3.9	4.1	4.1	4.2	4.2
Japan												
All fields	25,086	26,368	29,617	28,894	32,832	34,375	36,674	6.8	7.1	7.6	7.6	8.5
Clinical medicine.....	5,908	6,730	7,861	8,408	9,559	10,269	11,163	5.1	5.6	6.3	6.7	7.9
Biomedical research.....	3,429	3,776	4,339	4,556	5,175	5,442	5,803	6.2	6.6	6.7	7.1	8.4
Biology	2,404	2,371	2,456	2,267	2,363	2,557	2,543	6.1	6.3	7.0	6.9	7.5
Chemistry	5,926	5,571	5,887	5,744	5,907	6,173	6,117	10.9	10.3	10.7	10.8	10.5
Physics	3,750	3,750	4,775	4,557	6,116	6,088	6,982	8.2	8.0	8.8	8.5	10.0
Earth and space sciences ...	394	381	592	644	736	725	797	2.3	2.3	3.3	3.5	3.7
Engineering and technology..	2,827	3,290	3,213	2,460	2,580	2,777	2,976	9.2	10.3	11.5	10.1	10.1
Mathematics.....	449	498	495	258	395	343	293	4.3	5.3	5.2	3.6	4.6

(continued)

Appendix table 5-32.

Scientific and technical articles, by country and field: 1981–93

(page 4 of 7)

Field	Article publication year													
	Number						Percent							
	Canada													
All fields	14,438	15,073	16,655	16,677	17,231	17,225	17,436	3.9	4.0	4.3	4.4	4.3	4.2	4.2
Clinical medicine.....	4,006	4,252	4,817	5,087	5,194	5,180	5,034	3.4	3.6	3.8	4.1	4.0	4.0	3.8
Biomedical research	2,254	2,504	2,647	2,767	2,879	2,917	3,071	4.1	4.4	4.1	4.3	4.2	4.2	4.5
Biology	2,456	2,645	2,884	2,808	2,813	2,736	2,670	6.3	7.0	8.3	8.6	8.2	8.0	8.0
Chemistry	1,670	1,582	1,726	1,692	1,653	1,587	1,730	3.1	2.9	3.1	3.2	2.9	2.8	3.0
Physics	1,335	1,362	1,732	1,520	1,668	1,801	1,831	2.9	2.9	3.2	2.8	2.7	3.0	2.9
Earth and space sciences	888	911	1,061	1,247	1,310	1,321	1,343	5.2	5.5	5.9	6.8	7.0	6.8	6.4
Engineering and technology..	1,303	1,348	1,348	1,235	1,213	1,345	1,373	4.2	4.2	4.8	5.1	4.8	4.9	4.7
Mathematics.....	527	470	441	322	501	337	386	5.1	5.0	4.6	4.5	5.4	4.6	4.7
Former Soviet Union														
All fields	29,609	30,896	30,293	27,474	29,993	27,031	21,396	8.0	8.3	7.8	7.3	7.4	6.7	5.1
Clinical medicine.....	3,797	3,994	3,646	3,514	3,675	3,597	1,442	3.3	3.3	2.9	2.8	2.8	2.8	1.1
Biomedical research	3,148	3,452	5,618	5,169	5,177	4,758	2,611	5.7	6.0	8.7	8.0	7.5	6.9	3.8
Biology	1,112	1,051	936	760	796	756	786	2.8	2.8	2.7	2.3	2.3	2.2	2.3
Chemistry	9,077	10,091	8,462	7,399	8,164	7,036	5,882	16.7	18.6	15.3	13.9	14.5	12.4	10.1
Physics	7,647	7,664	8,422	7,631	9,347	7,915	7,838	16.8	16.3	15.6	14.3	15.2	13.0	12.3
Earth and space sciences	1,704	1,748	1,271	1,301	1,298	1,081	1,167	10.0	10.6	7.1	7.1	6.9	5.5	5.6
Engineering and technology..	2,340	2,298	1,663	1,358	1,239	1,558	1,382	7.6	7.2	5.9	5.6	4.9	5.6	4.8
Mathematics.....	784	597	275	342	296	328	287	7.6	6.3	2.9	4.8	3.2	4.4	3.5
Other Eastern/Central Europe														
All fields	11,023	10,470	10,420	9,096	9,571	8,585	8,769	3.0	2.8	2.7	2.4	2.4	2.1	2.1
Clinical medicine.....	2,111	1,816	1,688	1,448	1,392	1,199	1,134	1.8	1.5	1.3	1.2	1.1	0.9	0.9
Biomedical research	1,716	1,516	1,765	1,666	1,608	1,405	1,449	3.1	2.6	2.7	2.6	2.3	2.0	2.1
Biology	1,048	986	769	408	466	417	486	2.7	2.6	2.2	1.2	1.4	1.2	1.4
Chemistry	3,290	3,298	3,209	2,840	3,016	2,713	2,778	6.0	6.1	5.8	5.3	5.4	4.8	4.8
Physics	1,601	1,621	1,743	1,731	1,978	1,803	1,896	3.5	3.5	3.2	3.2	3.2	3.0	3.0
Earth and space sciences	249	247	237	231	213	271	300	1.5	1.5	1.3	1.3	1.1	1.4	1.4
Engineering and technology..	684	670	573	533	530	537	590	2.2	2.1	2.0	2.2	2.1	1.9	2.0
Mathematics.....	320	317	436	236	369	240	235	3.1	3.3	4.6	3.3	4.0	3.2	2.9

(continued)

Appendix table 5-32.
Scientific and technical articles, by country and field: 1981–93
 (page 5 of 7)

Field	Article publication year													
	Number						Percent							
	1981	1983	1985	1987	1989	1991	1993	1981	1983	1985	1987	1989	1991	1993
Israel														
All fields	3,697	3,968	4,233	3,977	3,980	3,690	4,126	1.0	1.1	1.1	1.1	1.0	0.9	1.0
Clinical medicine.....	1,283	1,440	1,641	1,569	1,511	1,425	1,488	1.1	1.2	1.3	1.3	1.2	1.1	1.1
Biomedical research	553	639	643	607	596	580	644	1.0	1.1	1.0	0.9	0.9	0.8	0.9
Biology	440	425	407	390	417	375	403	1.1	1.1	1.2	1.2	1.2	1.1	1.2
Chemistry	345	315	374	316	338	263	303	0.6	0.6	0.7	0.6	0.6	0.5	0.5
Physics	504	524	526	552	585	554	699	1.1	1.1	1.0	1.0	1.0	0.9	1.1
Earth and space sciences ...	128	139	139	171	145	152	217	0.8	0.8	0.8	0.9	0.8	0.8	1.0
Engineering and technology..	293	296	349	244	249	235	230	1.0	0.9	1.2	1.0	1.0	0.9	0.8
Mathematics.....	151	190	154	129	139	106	143	1.5	2.0	1.6	1.8	1.5	1.4	1.8
Other Middle East														
All fields	765	783	1,051	1,267	1,377	1,198	1,206	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Clinical medicine.....	236	211	327	424	443	440	451	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Biomedical research	67	64	103	115	94	82	78	0.1	0.1	0.2	0.2	0.1	0.1	0.1
Biology	106	97	99	115	142	115	124	0.3	0.3	0.3	0.4	0.4	0.3	0.4
Chemistry	121	141	177	228	251	198	177	0.2	0.3	0.3	0.4	0.4	0.3	0.3
Physics	67	68	90	83	103	100	115	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Earth and space sciences ...	33	48	50	59	82	73	57	0.2	0.3	0.3	0.3	0.4	0.4	0.3
Engineering and technology..	104	131	171	213	233	173	209	0.3	0.4	0.6	0.9	0.9	0.6	0.7
Mathematics.....	36	32	41	36	40	23	19	0.3	0.3	0.4	0.5	0.4	0.3	0.2
Africa														
All fields	4,797	4,601	4,804	4,969	5,118	5,112	4,706	1.3	1.2	1.2	1.3	1.3	1.3	1.1
Clinical medicine.....	1,713	1,768	1,751	1,738	1,690	1,575	1,524	1.5	1.5	1.4	1.4	1.3	1.2	1.2
Biomedical research	432	413	499	605	608	557	483	0.8	0.7	0.8	0.9	0.9	0.8	0.7
Biology	1,015	952	911	943	948	974	931	2.6	2.5	2.6	2.9	2.8	2.8	2.8
Chemistry	757	623	732	781	884	1,032	853	1.4	1.1	1.3	1.5	1.6	1.8	1.5
Physics	251	235	248	288	330	370	370	0.6	0.5	0.5	0.5	0.5	0.6	0.6
Earth and space sciences ...	199	183	264	281	300	314	276	1.2	1.1	1.5	1.5	1.6	1.6	1.3
Engineering and technology..	345	359	303	274	288	266	271	1.1	1.1	1.1	1.1	1.1	1.0	0.9
Mathematics.....	92	79	113	69	86	38	69	0.9	0.8	1.2	1.0	0.9	0.5	0.8

(continued)

Appendix table 5-32.

Scientific and technical articles, by country and field: 1981–93

(page 6 of 7)

Field	Article publication year													
	Number						Percent							
	1981	1983	1985	1987	1989	1991	1993	1981	1983	1985	1987	1989	1991	1993
Australia and New Zealand														
All fields	9,858	9,564	9,951	9,682	10,097	9,995	10,646	2.7	2.6	2.6	2.6	2.5	2.5	2.5
Clinical medicine.....	3,071	3,140	3,339	3,392	3,545	3,505	3,634	2.6	2.6	2.7	2.7	2.7	2.7	2.8
Biomedical research.....	1,213	1,213	1,429	1,380	1,464	1,539	1,563	2.2	2.1	2.2	2.1	2.1	2.2	2.3
Biology	2,343	2,177	2,131	1,969	2,152	2,087	2,227	6.0	5.8	6.1	6.0	6.3	6.1	6.6
Chemistry	1,080	916	887	921	889	868	976	2.0	1.7	1.6	1.7	1.6	1.5	1.7
Physics	687	648	749	713	681	710	851	1.5	1.4	1.4	1.3	1.1	1.2	1.3
Earth and space sciences ...	690	634	662	680	740	709	740	4.1	3.8	3.7	3.7	4.0	3.6	3.5
Engineering and technology..	549	646	532	471	429	440	475	1.8	2.0	1.9	1.9	1.7	1.6	1.6
Mathematics.....	227	190	221	157	198	137	181	2.2	2.0	2.3	2.2	2.2	1.9	2.2
India														
All fields	11,724	10,794	9,586	8,240	8,440	8,039	8,008	3.2	2.9	2.5	2.2	2.1	2.0	1.9
Clinical medicine.....	1,510	1,444	1,184	1,173	1,059	1,116	1,099	1.3	1.2	0.9	0.9	0.8	0.9	0.8
Biomedical research.....	1,605	1,320	1,622	1,343	1,324	947	985	2.9	2.3	2.5	2.1	1.9	1.4	1.4
Biology	1,927	1,620	857	811	775	713	655	4.9	4.3	2.5	2.5	2.3	2.1	2.0
Chemistry	3,191	2,863	2,674	2,209	2,535	2,348	2,310	5.9	5.3	4.8	4.1	4.5	4.1	4.0
Physics	1,713	1,778	1,578	1,399	1,493	1,537	1,520	3.8	3.8	2.9	2.6	2.4	2.5	2.4
Earth and space sciences ...	479	502	508	428	391	464	451	2.8	3.0	2.8	2.3	2.1	2.4	2.1
Engineering and technology..	954	948	863	792	737	830	890	3.1	3.0	3.1	3.3	2.9	3.0	3.1
Mathematics.....	346	319	300	84	126	86	98	3.3	3.4	3.1	1.2	1.4	1.2	1.2
Central and South America														
All fields	4,356	4,504	4,637	4,817	5,345	5,639	6,219	1.2	1.2	1.2	1.3	1.3	1.4	1.5
Clinical medicine.....	1,367	1,436	1,313	1,280	1,439	1,519	1,625	1.2	1.2	1.0	1.0	1.1	1.2	1.2
Biomedical research.....	777	764	878	902	1,004	1,001	1,032	1.4	1.3	1.4	1.4	1.5	1.4	1.5
Biology	629	641	580	608	671	794	895	1.6	1.7	1.7	1.9	2.0	2.3	2.7
Chemistry	529	514	582	680	636	640	785	1.0	0.9	1.1	1.3	1.1	1.1	1.3
Physics	567	618	784	790	963	1,005	1,194	1.2	1.3	1.5	1.5	1.6	1.7	1.9
Earth and space sciences ...	220	204	207	284	285	332	366	1.3	1.2	1.2	1.6	1.5	1.7	1.7
Engineering and technology..	182	242	185	168	221	232	259	0.6	0.8	0.7	0.7	0.9	0.8	0.9
Mathematics.....	89	88	113	109	131	123	143	0.9	0.9	1.2	1.5	1.4	1.7	1.8

(continued)

Appendix table 5-32.
Scientific and technical articles, by country and field: 1981–93
 (page 7 of 7)

Field	Article publication year													
	Number						Percent							
	1981	1983	1985	1987	1989	1991	1993	1981	1983	1985	1987	1989	1991	1993
China														
All fields	1,099	1,692	1,943	2,600	3,761	4,330	5,019	0.3	0.5	0.5	0.7	0.9	1.1	1.2
Clinical medicine.	158	273	288	320	443	474	455	0.1	0.2	0.2	0.3	0.3	0.4	0.3
Biomedical research	49	92	179	254	294	342	372	0.1	0.2	0.3	0.4	0.4	0.5	0.5
Biology	178	274	156	124	136	172	196	0.5	0.7	0.4	0.4	0.4	0.5	0.6
Chemistry	89	169	185	406	568	823	1,128	0.2	0.3	0.3	0.8	1.0	1.5	1.9
Physics	241	337	573	911	1,487	1,516	1,772	0.5	0.7	1.1	1.7	2.4	2.5	2.8
Earth and space sciences . . .	240	215	268	173	143	252	170	1.4	1.3	1.5	0.9	0.8	1.3	0.8
Engineering and technology.. .	113	215	227	344	567	598	711	0.4	0.7	0.8	1.4	2.2	2.2	2.5
Mathematics.	31	117	67	68	123	153	215	0.3	1.2	0.7	1.0	1.3	2.1	2.6
East Asian NIEs														
All fields	656	904	1,397	2,390	3,417	4,373	6,203	0.2	0.2	0.4	0.6	0.8	1.1	1.5
Clinical medicine.	125	157	280	603	858	959	1,313	0.1	0.1	0.2	0.5	0.7	0.7	1.0
Biomedical research	52	58	108	227	315	396	569	0.1	0.1	0.2	0.4	0.5	0.6	0.8
Biology	80	100	100	169	233	238	318	0.2	0.3	0.3	0.5	0.7	0.7	0.9
Chemistry	135	212	293	504	666	963	1,295	0.2	0.4	0.5	0.9	1.2	1.7	2.2
Physics	91	137	241	330	523	722	1,138	0.2	0.3	0.4	0.6	0.9	1.2	1.8
Earth and space sciences . . .	20	10	26	65	58	85	136	0.1	0.1	0.1	0.4	0.3	0.4	0.6
Engineering and technology.. .	111	188	277	441	651	929	1,317	0.4	0.6	1.0	1.8	2.6	3.4	4.5
Mathematics.	42	42	72	51	113	81	117	0.4	0.4	0.8	0.7	1.2	1.1	1.4
Other Asian/Pacific														
All fields	1,160	1,166	1,264	1,391	1,636	1,843	2,165	0.3	0.3	0.3	0.4	0.4	0.5	0.5
Clinical medicine.	326	311	348	400	512	644	750	0.3	0.3	0.3	0.3	0.4	0.5	0.6
Biomedical research	120	134	142	148	157	162	201	0.2	0.2	0.2	0.2	0.2	0.2	0.3
Biology	284	289	262	292	310	323	348	0.7	0.8	0.8	0.9	0.9	0.9	1.0
Chemistry	114	133	168	207	240	258	347	0.2	0.2	0.3	0.4	0.4	0.5	0.6
Physics	120	105	137	128	155	192	224	0.3	0.2	0.3	0.2	0.3	0.3	0.4
Earth and space sciences . . .	47	44	59	80	99	95	123	0.3	0.3	0.3	0.4	0.5	0.5	0.6
Engineering and technology.. .	120	124	107	120	131	139	172	0.4	0.4	0.4	0.5	0.5	0.5	0.6
Mathematics.	35	28	45	21	38	36	31	0.3	0.3	0.5	0.3	0.4	0.5	0.4

NIE = newly industrialized economy

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF special tabulations.

See figures 5-22 and 5-23.

Appendix table 5-33.

Selected countries' distribution of scientific and technical literature, by field: 1981–93
 (page 1 of 7)

Field	Article publication year												
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
	Percent of country's total in field												
	United States												
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Clinical medicine	36.3	36.3	36.3	37.2	36.7	36.8	37.1	36.1	35.9	35.7	35.2	35.2	35.7
Biomedical research	16.5	17.0	17.0	16.9	17.8	18.0	18.2	18.1	18.8	18.9	18.9	19.4	19.3
Biology	11.1	11.2	10.7	10.8	9.5	9.4	9.1	9.0	9.0	9.3	9.0	8.4	8.0
Chemistry	8.2	8.8	8.3	8.5	8.4	8.9	8.8	9.0	8.8	9.0	9.2	9.0	9.4
Physics	9.9	9.9	9.8	9.7	11.5	11.9	12.0	12.7	12.5	12.2	12.7	12.5	12.0
Earth and space sciences	5.5	5.3	5.2	5.1	5.6	5.7	5.8	5.5	5.5	5.5	5.7	5.8	6.1
Engineering and technology	9.4	8.7	9.9	9.1	7.9	7.1	6.9	6.9	6.8	7.2	7.0	7.6	7.1
Mathematics	3.0	2.8	2.8	2.6	2.7	2.3	2.2	2.7	2.6	2.2	2.2	2.2	2.3
	United Kingdom												
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	36.9	37.0	38.0	38.7	41.0	41.4	41.3	41.3	42.4	42.3	42.1	41.0	40.9
Biomedical research	15.3	16.1	16.1	15.5	16.4	16.2	16.2	16.0	16.5	16.7	17.1	16.9	16.8
Biology	11.4	11.1	11.0	11.5	9.6	10.3	9.5	8.4	8.7	8.7	7.8	7.9	7.8
Chemistry	11.7	12.1	10.9	10.9	10.2	10.0	10.6	11.3	10.3	10.8	10.8	10.6	11.1
Physics	9.4	9.3	9.1	8.9	9.4	9.5	9.9	10.7	10.0	9.8	10.0	10.8	10.4
Earth and space sciences	4.7	4.7	4.6	4.7	4.6	4.6	4.4	4.2	4.6	4.5	4.6	4.9	5.2
Engineering and technology	8.4	7.7	8.3	7.7	6.8	6.2	6.1	6.3	5.8	5.9	6.1	6.3	6.2
Mathematics	2.0	2.0	2.0	2.0	2.0	1.8	2.0	1.7	1.7	1.3	1.5	1.7	1.5
	Germany												
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	30.5	30.7	31.2	30.1	29.9	29.8	30.1	29.3	30.1	29.3	29.0	30.4	29.2
Biomedical research	14.6	15.8	15.7	15.0	14.5	15.1	15.8	15.5	15.9	15.9	15.7	14.9	15.1
Biology	8.8	8.4	7.5	8.3	6.9	7.0	7.1	6.8	6.6	6.9	6.6	5.6	5.6
Chemistry	17.1	17.0	16.9	16.7	18.8	18.1	18.0	18.7	17.8	17.6	18.0	17.2	18.6
Physics	13.0	14.2	14.6	15.1	15.8	16.3	16.7	17.8	17.7	18.1	18.1	19.1	19.2
Earth and space sciences	3.1	3.0	3.1	2.9	3.3	3.0	3.2	2.8	3.1	3.3	3.3	3.6	3.6
Engineering and technology	8.6	8.1	8.3	9.0	7.9	8.0	7.2	6.8	6.5	7.0	7.4	7.3	7.0
Mathematics	4.2	2.7	2.7	2.9	2.8	2.6	1.8	2.3	2.2	1.8	1.9	1.9	1.9

(continued)

Appendix table 5-33.

Selected countries' distribution of scientific and technical literature, by field: 1981-93
 (page 2 of 7)

Field	Article publication year												
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
	Percent of country's total in field												
	France												
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Clinical medicine	32.7	32.2	31.6	31.8	29.1	30.7	30.9	30.1	29.7	31.0	30.4	29.2	28.8
Biomedical research	15.5	15.6	15.7	15.6	17.6	17.2	17.5	16.9	17.3	17.1	18.2	17.6	17.6
Biology	7.4	7.0	7.1	7.0	6.2	5.7	5.8	5.9	5.9	6.4	5.9	6.2	5.9
Chemistry	17.2	17.0	15.9	16.1	17.7	16.5	17.1	16.6	16.4	16.1	17.2	16.1	16.3
Physics	14.4	15.3	16.7	16.8	17.5	18.8	17.4	18.6	18.2	17.4	16.7	17.8	17.4
Earth and space sciences	4.2	4.1	4.2	4.0	3.7	4.2	4.8	4.2	4.2	4.7	4.5	4.3	4.7
Engineering and technology	5.5	5.7	5.5	5.3	4.6	5.0	4.6	4.6	4.9	5.5	5.5	5.6	6.2
Mathematics	3.1	3.1	3.3	3.5	3.6	1.9	1.9	3.1	3.5	1.8	1.7	3.2	3.2
	Italy												
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Clinical medicine	34.8	33.9	35.4	34.8	38.5	40.1	39.7	38.5	37.7	38.2	38.8	37.4	36.5
Biomedical research	14.2	14.0	14.7	14.3	14.7	14.5	13.3	13.7	14.3	14.5	14.4	14.3	15.0
Biology	5.8	6.4	4.8	5.0	3.7	3.9	4.2	3.9	4.0	4.5	4.1	4.5	4.4
Chemistry	18.7	18.8	18.6	19.9	16.2	16.6	16.1	16.5	15.2	15.5	14.7	14.7	14.8
Physics	14.7	15.8	15.7	14.9	16.1	14.8	16.4	16.8	17.0	16.1	16.1	17.3	17.2
Earth and space sciences	4.5	4.0	3.7	3.4	3.4	3.9	3.7	3.7	4.1	4.2	4.6	4.6	4.8
Engineering and technology	5.5	5.2	5.2	5.3	5.0	4.0	3.9	4.5	5.0	4.8	5.1	5.4	5.1
Mathematics	1.8	2.0	1.8	2.4	2.4	2.3	2.6	2.4	2.7	2.2	2.1	1.9	2.1
	Other Southern Europe												
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Clinical medicine	23.5	22.8	21.5	18.9	18.9	19.7	21.4	21.7	22.2	21.7	24.5	24.5	23.8
Biomedical research	17.6	18.1	16.0	17.8	16.3	17.4	18.1	16.5	16.2	17.8	16.6	14.0	14.6
Biology	8.5	7.2	7.2	7.2	6.7	7.1	7.5	8.0	8.6	9.0	9.0	10.4	9.9
Chemistry	23.7	26.2	28.4	28.1	30.2	28.6	25.0	24.2	23.2	23.3	21.8	22.5	22.4
Physics	13.6	13.7	14.3	14.7	15.4	14.6	14.6	15.8	15.3	14.5	14.9	15.3	15.1
Earth and space sciences	3.4	3.3	3.0	3.0	3.2	3.9	4.4	4.1	4.8	5.5	4.9	4.9	5.2
Engineering and technology	6.8	5.8	6.4	7.0	5.7	6.0	6.5	6.2	6.3	6.1	6.2	6.2	6.4
Mathematics	3.0	2.8	3.4	3.3	3.6	2.7	2.5	3.5	3.5	2.1	2.1	2.3	2.6

(continued)

Appendix table 5-33.

Selected countries' distribution of scientific and technical literature, by field: 1981–93

(page 3 of 7)

Field	Article publication year												
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Percent of country's total in field													
Nordic Countries													
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	52.0	55.1	53.8	54.6	53.7	53.2	53.3	51.2	51.3	51.5	48.4	47.7	47.1
Biomedical research	16.0	14.9	15.2	15.5	16.3	15.8	16.3	17.0	17.2	16.7	17.3	17.1	16.9
Biology	7.8	7.2	7.7	7.1	6.8	7.6	6.9	7.8	7.7	8.3	8.3	9.0	8.4
Chemistry	8.1	7.1	6.7	7.0	7.3	7.8	7.6	7.3	7.2	7.2	7.7	7.7	8.5
Physics	7.1	7.4	7.6	7.0	7.3	7.2	7.9	8.0	8.1	7.9	8.5	9.1	9.7
Earth and space sciences.....	2.7	2.5	2.6	3.1	3.7	3.4	3.7	3.9	3.7	4.0	4.6	4.5	4.2
Engineering and technology	4.5	4.1	4.8	4.3	3.4	3.4	3.2	3.2	3.4	3.3	4.3	3.9	4.0
Mathematics	1.9	1.6	1.6	1.3	1.5	1.4	1.2	1.6	1.4	1.1	1.0	1.1	1.2
Other western Europe													
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	38.3	39.3	39.8	39.8	39.2	41.7	40.4	40.0	41.4	39.9	39.6	39.5	39.2
Biomedical research	15.2	15.6	15.6	15.5	16.7	16.5	16.8	16.7	16.8	16.8	17.7	17.5	17.6
Biology	8.1	8.4	8.2	7.9	7.7	7.0	7.0	7.0	7.2	7.7	6.6	6.7	7.1
Chemistry	13.6	13.2	12.1	12.2	12.2	11.7	12.4	12.5	11.4	12.3	12.3	12.0	12.2
Physics	13.0	13.2	13.0	13.3	13.6	13.5	14.2	14.2	14.0	13.8	14.1	14.6	13.6
Earth and space sciences.....	3.2	2.9	3.2	3.0	3.9	3.6	3.6	3.3	3.5	3.5	3.5	3.9	4.1
Engineering and technology	6.2	5.2	5.9	5.7	4.7	3.9	3.8	4.3	3.8	4.3	4.4	4.4	4.6
Mathematics	2.4	2.1	2.3	2.6	2.2	2.1	1.7	2.0	2.0	1.7	1.8	1.5	1.6
Japan													
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	23.6	24.3	25.5	25.8	26.5	27.3	29.1	26.8	29.1	27.9	29.9	30.0	30.4
Biomedical research	13.7	14.2	14.3	14.0	14.7	15.4	15.8	15.1	15.8	15.8	15.8	15.6	15.8
Biology	9.6	9.6	9.0	9.4	8.3	7.5	7.8	7.4	7.2	7.3	7.4	6.8	6.9
Chemistry	23.6	22.9	21.1	21.3	19.9	20.0	19.9	18.7	18.0	19.7	18.0	17.7	16.7
Physics	14.9	15.2	14.2	13.9	16.1	15.6	15.8	20.1	18.6	18.5	17.7	19.4	19.0
Earth and space sciences.....	1.6	1.4	1.4	1.5	2.0	2.3	2.2	1.9	2.2	2.1	2.1	2.0	2.2
Engineering and technology	11.3	10.6	12.5	12.3	10.8	11.2	8.5	8.8	7.9	7.9	8.1	7.6	8.1
Mathematics	1.8	1.8	1.9	1.8	1.7	0.9	0.9	1.2	1.2	0.8	1.0	0.8	0.8

(continued)

Appendix table 5-33.

Selected countries' distribution of scientific and technical literature, by field: 1981-93
(page 4 of 7)

Field	Article publication year											
	Percent of country's total in field											
	Canada											
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	27.7	27.8	28.2	28.7	28.9	30.3	30.5	29.7	30.1	28.9	30.1	30.3
Biomedical research	15.6	15.7	16.6	15.7	15.9	15.5	16.6	16.5	16.7	17.4	16.9	17.1
Biology	17.0	18.0	17.5	18.0	17.3	17.0	16.8	17.5	16.3	16.9	15.9	15.2
Chemistry	11.6	11.6	10.5	10.3	10.4	10.2	10.1	9.6	9.6	10.0	9.2	9.9
Physics	9.2	9.4	9.0	9.3	10.4	10.0	9.1	9.9	9.7	9.6	10.5	10.0
Earth and space sciences.....	6.2	6.5	6.0	6.6	6.4	7.3	7.5	6.7	7.6	7.9	7.7	7.5
Engineering and technology	9.0	7.9	8.9	8.7	8.1	7.6	7.4	7.3	7.0	7.4	7.8	7.9
Mathematics	3.7	3.1	3.1	2.7	2.6	2.2	1.9	2.7	2.9	2.0	2.0	2.2
Former Soviet Union												
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	12.8	13.0	12.9	12.7	12.0	12.4	12.8	12.9	12.3	11.6	13.3	7.8
Biomedical research	10.6	11.8	11.2	11.4	18.5	18.4	18.8	18.1	17.3	17.2	17.6	15.8
Biology	3.8	3.6	3.4	3.7	3.1	2.8	2.8	2.9	2.7	2.9	2.8	3.0
Chemistry	30.7	30.5	32.7	31.8	27.9	28.6	26.9	27.8	27.2	28.1	26.0	27.5
Physics	25.8	26.2	24.8	26.1	27.8	27.2	27.8	29.2	31.2	30.6	29.3	33.0
Earth and space sciences.....	5.8	5.8	5.7	5.3	4.2	4.4	4.7	3.7	4.3	4.1	4.0	5.7
Engineering and technology	7.9	6.9	7.4	7.2	5.5	5.0	4.9	4.3	4.1	4.3	5.8	5.6
Mathematics	2.6	2.1	1.9	1.9	0.9	1.2	1.2	1.1	1.0	1.2	1.2	1.3
Other Eastern/Central Europe												
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	19.2	17.9	17.3	17.1	16.2	16.8	15.9	14.9	14.5	15.2	14.0	14.2
Biomedical research	15.6	15.3	14.5	14.0	16.9	17.3	18.3	16.5	16.8	16.9	16.4	15.1
Biology	9.5	9.1	9.4	9.6	7.4	5.1	4.5	4.5	4.9	5.0	4.9	5.3
Chemistry	29.8	30.1	31.5	31.6	30.8	31.9	31.2	30.0	31.5	29.8	31.6	31.4
Physics	14.5	15.3	15.5	14.9	16.7	18.3	19.0	21.6	20.7	21.7	21.0	21.6
Earth and space sciences.....	2.3	2.5	2.4	2.3	2.3	2.9	2.5	2.2	2.2	2.8	3.2	3.0
Engineering and technology	6.2	6.6	6.4	7.1	5.5	4.9	5.9	6.1	5.5	5.7	6.3	6.7
Mathematics	2.9	3.2	3.0	3.4	4.2	2.9	2.6	4.2	3.9	2.7	2.8	3.3

(continued)

Appendix table 5-33.

Selected countries' distribution of scientific and technical literature, by field: 1981–93

(page 5 of 7)

Field	Article publication year												
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
	Percent of country's total in field												
Israel													
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	34.7	35.2	36.3	38.2	38.8	38.2	39.5	38.2	38.0	37.9	38.6	38.0	36.1
Biomedical research	15.0	16.6	16.1	15.3	15.2	15.5	15.3	14.6	15.0	15.8	15.7	16.1	15.6
Biology	11.9	10.5	10.7	11.1	9.6	9.7	9.8	9.1	10.5	9.9	10.2	9.5	9.8
Chemistry	9.3	8.5	7.9	9.0	8.8	8.5	7.9	7.3	8.5	7.8	7.1	7.1	7.3
Physics	13.6	14.1	13.2	12.4	12.4	13.8	13.9	16.2	14.7	15.3	15.0	15.5	16.9
Earth and space sciences	3.5	3.4	3.5	3.0	3.3	3.2	4.3	4.2	3.6	3.3	4.1	4.0	5.3
Engineering and technology	7.9	7.3	7.5	7.7	8.2	7.3	6.1	6.5	6.3	6.4	6.4	6.8	5.6
Mathematics	4.1	4.3	4.8	3.4	3.6	3.7	3.2	4.0	3.5	3.7	2.9	3.1	3.5
Other Middle East													
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	30.8	29.1	26.9	28.0	31.1	32.0	33.5	33.4	32.2	32.0	36.7	39.2	36.7
Biomedical research	8.8	6.7	8.2	9.3	9.8	9.2	9.1	9.1	6.8	8.2	6.8	6.4	6.3
Biology	13.9	12.6	12.4	11.4	9.4	8.9	9.1	9.4	10.3	9.2	9.6	10.5	10.1
Chemistry	15.8	18.8	18.0	18.0	16.8	20.2	18.0	16.8	18.2	20.5	16.5	14.4	14.4
Physics	8.8	9.4	8.7	8.3	8.6	9.4	6.6	8.0	7.5	8.6	8.3	7.6	9.3
Earth and space sciences	4.3	3.0	6.1	5.0	4.8	4.6	4.7	5.5	6.0	4.6	6.1	6.0	4.6
Engineering and technology	13.6	13.6	16.7	16.4	16.3	13.7	16.8	15.4	16.9	14.9	14.4	14.4	17.0
Mathematics	4.7	6.8	4.1	4.3	3.9	2.7	2.8	3.1	2.9	2.7	1.9	2.0	1.5
Africa													
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	35.7	36.8	38.4	37.5	36.4	36.1	35.0	34.6	33.0	32.9	30.8	31.5	31.9
Biomedical research	9.0	9.5	9.0	9.4	10.4	10.5	12.2	11.3	11.9	10.3	10.9	10.5	10.1
Biology	21.2	20.5	20.7	21.0	19.0	18.8	19.0	18.8	18.5	20.1	19.1	18.4	19.5
Chemistry	15.8	16.0	13.5	15.0	15.2	16.1	15.7	15.7	17.3	18.2	20.2	17.1	17.9
Physics	5.2	5.5	5.1	4.9	5.2	6.1	5.8	6.3	6.4	6.6	7.2	7.8	7.7
Earth and space sciences	4.1	3.6	4.0	3.8	5.5	5.5	5.7	5.6	5.9	5.4	6.1	7.3	5.8
Engineering and technology	7.2	6.4	7.8	6.5	6.3	5.7	5.5	5.8	5.6	5.5	5.2	6.3	5.7
Mathematics	1.9	1.9	1.7	2.1	2.4	1.4	1.4	2.3	1.7	1.2	0.7	1.3	1.4

(continued)

Appendix table 5-33.

Selected countries' distribution of scientific and technical literature, by field: 1981-93

(page 6 of 7)

Field	Article publication year											
	Percent of country's total in field											
	Australia and New Zealand											
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	31.1	32.0	32.8	32.4	33.6	34.0	35.0	34.0	35.1	33.5	35.1	34.6
Biomedical research	12.3	12.9	12.7	12.6	14.4	14.0	14.3	14.8	14.5	14.6	15.4	14.9
Biology	23.8	21.9	22.8	22.5	21.4	21.2	20.3	21.2	21.3	22.6	20.9	20.9
Chemistry	11.0	10.9	9.6	10.5	8.9	9.2	9.5	9.3	8.8	9.3	8.7	8.6
Physics	7.0	7.7	6.8	6.4	7.5	7.3	7.4	7.9	6.7	7.0	7.1	7.3
Earth and space sciences	7.0	6.8	6.6	7.3	6.7	7.5	7.0	6.2	7.3	7.0	7.1	7.2
Engineering and technology	5.6	5.6	6.8	6.3	5.3	5.2	4.9	4.6	4.2	4.6	4.4	5.0
Mathematics	2.3	2.3	2.0	2.0	2.2	1.7	1.6	2.0	2.0	1.4	1.4	1.6
India												
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	12.9	12.9	13.4	12.5	12.4	11.7	14.2	13.3	12.5	14.8	13.9	14.0
Biomedical research	13.7	11.2	12.2	12.1	16.9	17.5	16.3	13.8	15.7	12.2	11.8	12.1
Biology	16.4	16.5	15.0	14.9	8.9	8.6	9.8	10.2	9.2	9.1	8.9	8.6
Chemistry	27.2	28.3	26.5	28.7	27.9	29.4	26.8	27.2	30.0	30.0	29.2	28.4
Physics	14.6	15.5	16.5	15.8	16.5	16.4	17.0	18.6	17.7	18.7	19.1	19.0
Earth and space sciences	4.1	4.3	4.7	4.9	5.3	6.1	5.2	5.3	4.6	5.3	5.8	5.9
Engineering and technology	8.1	8.3	8.8	8.2	9.0	8.9	9.6	9.8	8.7	8.7	10.3	10.5
Mathematics	3.0	3.0	3.0	2.9	3.1	1.4	1.0	1.7	1.5	1.2	1.1	1.2
Central and South America												
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	31.4	31.3	31.9	27.2	28.3	28.8	26.6	25.2	26.9	28.5	26.9	27.6
Biomedical research	17.8	16.9	17.0	18.1	18.9	16.8	18.7	17.8	18.8	17.8	17.8	16.4
Biology	14.4	14.5	14.2	15.1	12.5	12.3	12.6	12.9	12.6	13.3	14.1	13.1
Chemistry	12.1	13.0	11.4	12.1	12.6	14.4	14.1	12.7	11.9	11.5	11.3	12.0
Physics	13.0	14.1	13.7	16.0	16.9	16.5	16.4	18.7	18.0	17.2	17.8	18.4
Earth and space sciences	5.1	4.4	4.5	4.5	4.5	5.4	5.9	5.4	5.3	5.5	5.9	5.8
Engineering and technology	4.2	3.7	5.4	4.7	4.0	3.8	3.5	4.6	4.1	4.2	4.1	4.4
Mathematics	2.0	2.1	2.0	2.5	2.4	2.3	2.3	2.6	2.5	2.1	2.2	2.4

(continued)

Appendix table 5-33.

Selected countries' distribution of scientific and technical literature, by field: 1981–93
 (page 7 of 7)

Field	Article publication year												
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Percent of country's total in field													
China													
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	14.4	18.5	16.1	15.4	14.8	17.1	12.3	11.3	11.8	14.1	10.9	10.3	9.1
Biomedical research	4.5	5.6	5.4	5.1	9.2	11.3	9.8	7.5	7.8	7.8	7.9	7.7	7.4
Biology	16.2	16.4	16.2	13.6	8.0	4.8	4.8	3.1	3.6	3.8	4.0	3.8	3.9
Chemistry	8.1	9.4	10.0	8.2	9.5	12.1	15.6	14.6	15.1	17.9	19.0	19.6	22.5
Physics	21.9	22.3	19.9	23.8	29.5	31.6	35.0	42.7	39.5	36.8	35.0	38.0	35.3
Earth and space sciences	21.9	15.1	12.7	16.6	13.8	8.5	6.7	5.5	3.8	3.1	5.8	3.2	3.4
Engineering and technology	10.3	7.1	12.7	10.6	11.7	12.4	13.2	12.1	15.1	13.1	13.8	13.4	14.2
Mathematics	2.8	5.6	6.9	6.8	3.5	2.3	2.6	3.2	3.3	3.4	3.5	4.0	4.3
East Asian NIEs													
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	19.1	16.3	17.3	22.2	20.1	18.5	25.2	25.1	25.1	23.4	21.9	23.1	21.2
Biomedical research	8.0	9.4	6.4	6.8	7.7	7.0	9.5	8.6	9.2	8.3	9.1	9.3	9.2
Biology	12.2	10.6	11.0	9.0	7.2	5.8	7.1	7.0	6.8	5.9	5.4	5.4	5.1
Chemistry	20.6	22.7	23.4	22.1	21.0	24.2	21.1	18.9	19.5	21.3	22.0	20.8	20.9
Physics	13.9	16.6	15.1	15.0	17.3	17.2	13.8	15.6	15.3	16.1	16.5	17.5	18.3
Earth and space sciences	3.1	1.9	1.1	1.4	1.9	2.7	2.7	1.4	1.7	2.0	1.9	2.1	2.2
Engineering and technology	17.0	15.2	20.8	20.3	19.9	22.0	18.5	20.2	19.0	21.3	21.2	19.6	21.2
Mathematics	6.4	7.6	4.6	3.4	5.2	2.7	2.1	3.3	3.3	1.8	1.9	2.1	1.9
Other Asian/Pacific													
All fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Clinical medicine	28.1	29.2	26.7	28.8	27.5	27.3	28.8	32.3	31.3	32.6	34.9	35.1	34.2
Biomedical research	10.3	10.1	11.5	9.6	11.2	10.1	10.6	9.9	9.6	9.9	8.8	9.5	9.2
Biology	24.5	26.8	24.8	23.9	20.7	22.0	21.0	19.3	18.9	19.6	17.5	17.4	15.8
Chemistry	9.8	9.9	11.4	13.1	13.3	15.2	14.9	13.1	14.7	14.3	14.0	15.2	15.8
Physics	10.3	10.0	9.0	10.2	10.8	9.7	9.2	9.7	9.5	8.1	10.4	9.0	10.2
Earth and space sciences	4.1	4.8	3.8	4.0	4.7	6.0	5.8	5.0	6.1	5.9	5.2	4.8	5.6
Engineering and technology	10.3	7.6	10.6	7.3	8.5	8.3	8.6	7.6	8.0	7.9	7.5	7.7	7.8
Mathematics	3.0	2.1	2.4	3.1	3.6	1.9	1.5	3.6	2.3	2.1	2.0	1.8	1.4

NIE = newly industrialized economy

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF special tabulations.

See figure 5-21.

Science and Engineering Indicators – 1996

Appendix table 5-34.

Coauthored and internationally coauthored articles for selected countries: 1981–87 and 1988–93

Country	1981–87			1988–93			1981–87		1988–93		Change in international coauthored
	All articles	Coauthored articles	International coauthored	All articles	Coauthored articles	International coauthored	Coauthored articles	International coauthored	Coauthored articles	International coauthored	
	Number						Percent				
World	2,266,532	807,431	150,836	2,827,380	1,228,661	289,933	35.6	6.7	43.5	10.3	3.6
United States	987,214	451,613	90,552	908,125	478,964	124,305	45.7	9.2	52.7	13.7	4.5
United Kingdom.....	237,354	86,588	36,450	210,685	99,984	46,595	36.5	15.4	47.5	22.1	6.8
Germany.....	203,442	72,360	35,384	192,629	88,738	49,940	35.6	17.4	46.1	25.9	8.5
France	142,584	68,520	27,159	142,805	82,830	40,034	48.1	19.0	58.0	28.0	9.0
Italy	68,779	39,690	14,137	79,833	53,372	23,236	57.7	20.6	66.9	29.1	8.6
Other Southern Europe	44,183	18,451	8,759	66,883	35,088	19,600	41.8	19.8	52.5	29.3	9.5
Nordic countries	111,456	59,904	24,017	106,336	65,859	32,750	53.7	21.5	61.9	30.8	9.3
Other Western Europe	141,463	62,966	34,492	145,582	82,179	49,235	44.5	24.4	56.4	33.8	9.4
Japan.....	199,707	69,763	13,337	219,280	99,943	23,076	34.9	6.7	45.6	10.5	3.8
Canada.....	122,262	53,852	22,653	120,454	64,225	29,996	44.0	18.5	53.3	24.9	6.4
Former Soviet Union	210,786	33,794	6,542	172,854	36,488	13,021	16.0	3.1	21.1	7.5	4.4
East/Central Europe.....	78,696	29,002	14,981	66,296	33,171	21,946	36.9	19.0	50.0	33.1	14.1
Israel	32,054	17,929	7,944	28,957	18,571	9,676	55.9	24.8	64.1	33.4	8.6
Other Middle East	7,835	3,345	2,206	9,066	4,273	2,599	42.7	28.2	47.1	28.7	0.5
Africa	38,359	17,514	9,165	36,851	20,555	12,459	45.7	23.9	55.8	33.8	9.9
South/Central America	37,553	17,924	10,216	42,967	24,850	15,615	47.7	27.2	57.8	36.3	9.1
Australia & New Zealand	74,342	26,829	10,957	69,393	32,454	14,988	36.1	14.7	46.8	21.6	6.9
India.....	73,982	15,193	5,148	52,336	15,392	5,994	20.5	7.0	29.4	11.5	4.5
China	14,734	5,583	3,487	30,437	14,781	8,253	37.9	23.7	48.6	27.1	3.4
Asian NIEs.....	10,109	4,343	2,565	29,846	14,932	6,830	43.0	25.4	50.0	22.9	-2.5
Other Asia.....	10,973	5,554	4,206	14,499	8,795	6,333	50.6	38.3	60.7	43.7	5.3

NIE = newly industrialized economy

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF special tabulations.

Science and Engineering Indicators – 1996

Appendix table 5-35.

Patterns of international collaboration in science and engineering research: 1981–87 and 1988–93

(page 1 of 2)

Source country	Art.	MA	Intl'	Collaborating country																							
				US	UK	Ge	Fr	It	SEO	NC	WEO	Ja	Ca	USSR	EEO	Is	MO	Af	ANZ	In	SCA	Ch	NIES	APO			
Percent shared																											
1981–87																											
United States (US)	987,214	46	9	NA	12	11	7	5	3	7	10	7	12	1	2	5	1	2	4	2	5	2	1	1			
United Kingdom (UK)	237,354	36	15	28	NA	8	7	5	4	7	11	2	6	0	2	2	1	4	6	2	2	1	1	1			
Germany (Ge)	203,442	36	17	25	9	NA	8	4	3	7	16	3	2	4	8	2	0	2	2	1	2	1	0	1			
France (Fr)	142,584	48	19	23	9	10	NA	7	5	5	15	2	6	1	4	1	0	6	1	1	3	1	0	0			
Italy (It)	68,779	58	21	26	12	9	12	NA	3	5	16	1	2	2	4	1	0	1	1	1	1	2	0	0			
SEurope, other (SEO)	44,016	42	20	23	14	11	14	6	NA	5	11	1	3	2	4	1	0	1	1	1	1	3	0	0			
Nordic countries (NC)	111,023	54	21	30	13	12	7	4	2	NA	12	2	4	2	4	1	0	1	2	1	1	1	0	1			
WEurope, other (WEO)	142,063	45	24	24	12	17	12	7	3	7	NA	2	3	1	4	1	0	2	2	1	1	1	0	0			
Japan (Ja)	199,707	35	7	48	6	9	4	1	1	3	5	NA	5	1	2	1	0	1	2	2	1	1	2	3			
Canada (Ca)	122,262	44	19	47	10	4	8	2	1	4	5	3	NA	0	2	1	1	2	4	2	2	1	1	0			
Former USSR (USSR)	210,786	16	3	9	2	24	6	4	3	7	7	1	1	NA	31	0	0	0	0	1	1	0	0	1			
EEurope, other (EEO)	78,696	37	19	15	6	21	8	5	3	7	10	2	4	16	NA	0	0	1	1	1	1	0	0	0			
Israel (Is)	32,054	56	25	55	7	10	5	2	1	4	6	1	3	0	1	NA	0	2	1	0	1	0	0	0			
Mideast, other (MO)	7,835	43	28	32	21	5	6	1	1	3	3	1	6	1	1	0	NA	11	1	3	1	1	0	1			
Africa (Af)	38,357	46	24	25	17	7	18	2	1	3	8	1	4	0	2	2	2	NA	2	2	0	0	0	1			
Australia NZ (ANZ)	74,342	36	15	36	21	6	4	1	1	5	6	3	8	0	1	1	0	2	NA	1	1	1	1	2			
India (In)	73,982	21	7	32	12	10	4	3	1	3	6	5	8	1	2	0	1	3	3	NA	2	0	1	2			
S/Ctrl America (SCA)	37,553	48	27	44	8	8	9	3	4	3	4	2	6	1	2	1	0	2	1	1	NA	0	0	1			
China (Ch)	14,734	38	24	48	7	8	6	2	1	3	4	9	5	0	1	0	0	0	4	0	0	NA	1	0			
East Asian NIEs (NIE)	10,109	43	25	48	8	3	2	0	1	1	1	17	5	0	0	1	0	1	3	1	1	2	NA	3			
Asian/Pacific, other (APO)	10,975	51	38	28	16	8	3	1	1	3	4	8	3	2	2	0	1	2	9	2	2	0	2	NA			
1988–93																											
United States (US)	908,125	53	14	NA	10	10	8	5	4	7	9	8	11	2	3	4	1	2	4	2	5	2	3	1			
United Kingdom (UK)	210,685	47	22	25	NA	8	7	5	6	7	12	3	5	1	3	1	1	4	5	1	2	1	1	1			
Germany (Ge)	192,629	46	26	23	8	NA	8	5	4	6	16	3	3	5	8	2	0	2	2	1	2	1	0	1			
France (Fr)	142,805	58	28	21	8	10	NA	7	7	5	14	2	5	2	4	1	0	5	1	1	3	1	0	0			
Italy (It)	79,833	67	29	24	10	9	11	NA	6	5	14	2	3	3	5	1	0	1	1	1	3	1	0	0			
SEurope, other (SEO)	66,741	52	29	20	13	11	14	7	NA	6	11	1	3	3	4	1	0	1	1	0	4	1	0	0			
Nordic countries (NC)	105,636	62	31	26	11	11	7	4	4	NA	12	3	4	4	5	1	0	2	2	1	2	1	0	1			
WEurope, other (WEO)	146,424	57	34	21	11	16	12	7	5	7	NA	2	3	2	4	1	0	2	1	1	2	1	0	1			
Japan (Ja)	219,280	46	11	43	6	8	5	2	1	4	6	NA	5	1	2	1	0	1	3	1	1	4	3	2			
Canada (Ca)	120,454	53	25	43	8	5	8	2	2	4	6	4	NA	1	3	2	0	2	3	1	3	2	1	1			
Former USSR (USSR)	172,854	21	8	15	5	19	7	6	4	8	8	2	2	NA	17	1	0	1	1	1	2	1	0	1			
EEurope, other (EEO)	66,296	50	33	17	6	19	8	6	4	8	10	2	3	11	NA	0	0	1	1	1	1	1	0	0			
Israel (Is)	28,957	64	33	50	6	11	6	3	1	3	6	2	5	1	1	NA	0	2	1	0	1	0	0	0			
Mideast, other (MO)	10,528	46	28	27	21	7	4	2	1	4	4	2	5	1	1	0	NA	12	2	3	1	0	1	1			
Africa (Af)	36,851	56	34	23	15	7	19	3	1	5	9	2	4	1	1	1	2	NA	2	1	2	0	0	1			
Australia NZ (ANZ)	69,393	47	22	34	18	7	4	2	1	5	6	4	7	1	1	1	0	2	NA	1	1	2	2	3			
India (In)	52,336	29	11	31	11	11	5	4	2	3	6	5	6	2	3	0	1	2	2	NA	2	1	1	2			

(continued)

Appendix table 5-35.

Patterns of international collaboration in science and engineering research: 1981–87 and 1988–93

(page 2 of 2)

Source country	Art.	MA	Int'l	Collaborating country																				
				US	UK	Ge	Fr	It	SEO	NC	WEO	Ja	Ca	USSR	EEO	Is	MO	Af	ANZ	In	SCA			
Percent shared																								
S/Ctrl America (SCA)	42,967	58	36	36	8	8	10	5	7	4	5	2	5	2	2	1	0	2	1	1	NA	1	0	1
China (Ch)	30,437	49	27	33	7	8	5	4	2	4	6	11	6	1	1	0	0	0	3	1	1	NA	4	1
East Asian NIEs (NIE)	29,846	50	23	49	8	3	2	1	1	2	2	12	4	1	1	0	0	1	4	1	1	5	NA	2
Asian/Pacific, other (APO)	14,499	61	44	24	14	8	4	2	1	3	7	9	3	2	2	1	1	2	8	2	2	1	3	NA
Percent change, 1988–93 vs. 1981–87																								
United States (US)	NA	7	5	NA	-2	-1	0	1	1	-1	0	1	-1	1	-1	0	0	0	0	0	1	1	0	
United Kingdom (UK)	NA	11	7	-4	NA	0	0	0	2	0	0	1	-1	1	0	0	0	0	-1	0	0	1	1	0
Germany (Ge)	NA	10	9	-3	-1	NA	0	1	2	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
France (Fr)	NA	10	9	-1	-1	0	NA	0	2	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Italy (It)	NA	9	9	-2	-2	0	-2	NA	2	0	2	1	0	1	1	0	0	0	0	0	1	1	0	0
SEurope, other (SEO)	NA	11	9	-3	-1	-1	0	1	NA	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Nordic countries (NC)	NA	8	9	-4	-2	-1	0	1	2	NA	1	1	0	1	1	0	0	0	0	0	0	1	0	0
WEurope, other (WEO)	NA	12	9	-2	-1	-1	0	0	2	0	NA	0	0	1	0	0	0	0	0	0	0	1	0	0
Japan (Ja)	NA	11	4	-5	0	-1	0	1	1	1	0	NA	0	1	1	0	0	0	0	1	-1	0	2	0
Canada (Ca)	NA	9	6	-4	-2	1	0	1	1	0	1	0	NA	1	0	0	0	0	0	-1	0	1	0	0
Former USSR (USSR)	NA	5	4	7	2	-5	1	2	1	1	1	1	1	NA	-14	1	0	0	0	0	0	1	0	-1
EEurope, other (EEO)	NA	13	14	2	0	-2	0	1	1	1	1	1	0	-5	NA	0	0	0	0	0	0	0	0	0
Israel (Is)	NA	8	9	-5	-1	0	1	1	1	-1	0	1	2	1	0	NA	0	0	0	0	0	0	0	0
Mideast, other (MO)	NA	4	0	-5	0	1	-2	1	1	1	0	1	-1	0	0	0	0	NA	2	1	-1	0	0	0
Africa (Af)	NA	10	10	-2	-2	0	1	1	0	1	1	0	0	0	0	0	0	NA	0	-1	0	0	0	0
Australia NZ (ANZ)	NA	11	7	-2	-3	1	0	1	0	0	0	2	-1	1	0	0	0	0	NA	0	0	1	1	0
India (In)	NA	9	4	-2	-1	0	1	1	1	0	1	0	-2	1	1	0	0	-1	0	NA	0	1	0	0
S/Ctrl America (SCA)	NA	10	9	-8	-1	0	1	1	3	1	1	0	0	1	0	0	0	0	0	0	NA	0	0	
China (Ch)	NA	11	3	-15	0	1	-1	2	1	0	2	2	1	1	1	0	0	0	0	0	1	NA	3	0
East Asian NIEs (NIE)	NA	7	-2	1	0	0	1	0	0	0	0	-5	-1	1	0	0	0	0	0	-1	0	4	NA	-1
Asian/Pacific, other (APO)	NA	10	5	-4	-1	0	0	0	0	0	3	1	0	-1	0	0	0	-1	0	0	1	1	NA	

NA = not applicable; NIE = newly industrialized economy; NZ = New Zealand; Art = articles; MA = multiple authors; Int'l = international

NOTE: Percent shared refers to the percentage of the source country's internationally coauthored articles that are shared with the collaborating country.

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF special tabulations.

Appendix table 5-36.

Articles in U.S. natural science and engineering journals, by sector and field: 1981–93
 (page 1 of 5)

	All sectors	Academic institutions	Industry	Federal Government	FFRDCs	Nonprofit institutions	Other	Academic institutions	Industry	Federal Government	FFRDCs	Nonprofit institutions	Other
	Number						Percent						
	Clinical medicine												
1981	48,073	32,841	1,563	4,995	256	6,746	1,673	68.3	3.3	10.4	0.5	14.0	3.5
1982	48,531	33,388	1,626	5,006	235	6,554	1,722	68.8	3.4	10.3	0.5	13.5	3.5
1983	48,055	32,871	1,732	4,916	207	6,746	1,584	68.4	3.6	10.2	0.4	14.0	3.3
1984	48,735	33,319	1,860	4,992	216	6,762	1,587	68.4	3.8	10.2	0.4	13.9	3.3
1985	50,737	35,106	1,841	4,976	288	6,968	1,558	69.2	3.6	9.8	0.6	13.7	3.1
1986	50,734	34,987	2,116	5,029	254	6,803	1,546	69.0	4.2	9.9	0.5	13.4	3.0
1987	49,904	34,786	2,075	4,867	204	6,498	1,475	69.7	4.2	9.8	0.4	13.0	3.0
1988	49,930	34,721	2,146	4,846	225	6,633	1,362	69.5	4.3	9.7	0.5	13.3	2.7
1989	50,509	34,938	2,380	4,685	193	6,841	1,472	69.2	4.7	9.3	0.4	13.5	2.9
1990	50,321	35,058	2,477	4,623	192	6,588	1,384	69.7	4.9	9.2	0.4	13.1	2.8
1991	50,141	34,794	2,545	4,510	195	6,678	1,420	69.4	5.1	9.0	0.4	13.3	2.8
1992	50,325	35,111	2,638	4,288	179	6,618	1,493	69.8	5.2	8.5	0.4	13.2	3.0
1993	50,257	34,658	2,685	4,306	186	6,968	1,454	69.0	5.3	8.6	0.4	13.9	2.9
	Biomedical research												
1981	21,848	16,904	563	2,101	377	1,578	326	77.4	2.6	9.6	1.7	7.2	1.5
1982	22,733	17,705	568	2,085	336	1,702	337	77.9	2.5	9.2	1.5	7.5	1.5
1983	22,497	17,359	687	2,128	342	1,638	342	77.2	3.1	9.5	1.5	7.3	1.5
1984	22,196	17,113	771	2,044	280	1,652	338	77.1	3.5	9.2	1.3	7.4	1.5
1985	24,461	18,825	921	2,253	332	1,771	359	77.0	3.8	9.2	1.4	7.2	1.5
1986	24,765	18,797	1,164	2,291	344	1,818	352	75.9	4.7	9.3	1.4	7.3	1.4
1987	24,543	18,572	1,208	2,303	357	1,778	324	75.7	4.9	9.4	1.5	7.2	1.3
1988	25,072	19,074	1,263	2,220	361	1,882	272	76.1	5.0	8.9	1.4	7.5	1.1
1989	26,541	20,157	1,367	2,385	357	2,015	261	75.9	5.2	9.0	1.3	7.6	1.0
1990	26,660	20,279	1,382	2,336	379	1,977	308	76.1	5.2	8.8	1.4	7.4	1.2
1991	26,918	20,444	1,524	2,258	413	1,982	297	75.9	5.7	8.4	1.5	7.4	1.1
1992	27,782	21,255	1,535	2,273	360	2,050	309	76.5	5.5	8.2	1.3	7.4	1.1
1993	27,120	20,687	1,508	2,276	329	2,009	310	76.3	5.6	8.4	1.2	7.4	1.1

(continued)

Appendix table 5-36.

Articles in U.S. natural science and engineering journals, by sector and field: 1981-93
(page 2 of 5)

	All sectors	Academic institutions	Federal Government	FFRDCs	Nonprofit institutions	Other	Academic institutions	Federal Government	FFRDCs	Nonprofit institutions	Other		
	Number						Percent						
	Biology												
1981	14,739	11,053	332	2,221	130	553	451	75.0	2.3	15.1	0.9	3.8	3.1
1982	14,974	11,458	364	2,169	136	460	388	76.5	2.4	14.5	0.9	3.1	2.6
1983	14,216	10,804	342	2,136	113	471	351	76.0	2.4	15.0	0.8	3.3	2.5
1984	14,166	10,690	412	2,123	119	455	368	75.5	2.9	15.0	0.8	3.2	2.6
1985	13,083	10,077	383	1,792	96	398	337	77.0	2.9	13.7	0.7	3.0	2.6
1986	13,002	10,069	337	1,862	69	380	285	77.4	2.6	14.3	0.5	2.9	2.2
1987	12,231	9,547	359	1,670	73	328	255	78.1	2.9	13.7	0.6	2.7	2.1
1988	12,370	9,562	363	1,702	95	395	253	77.3	2.9	13.8	0.8	3.2	2.0
1989	12,726	9,705	385	1,812	85	431	308	76.3	3.0	14.2	0.7	3.4	2.4
1990	13,182	10,015	444	1,928	89	410	296	76.0	3.4	14.6	0.7	3.1	2.2
1991	12,862	9,743	439	1,875	59	422	325	75.8	3.4	14.6	0.5	3.3	2.5
1992	12,062	9,154	398	1,708	61	424	319	75.9	3.3	14.2	0.5	3.5	2.6
1993	11,304	8,583	395	1,595	65	375	292	75.9	3.5	14.1	0.6	3.3	2.6
	Chemistry												
1981	10,880	7,647	1,798	687	437	243	68	70.3	16.5	6.3	4.0	2.2	0.6
1982	11,758	8,242	1,860	848	478	245	86	70.1	15.8	7.2	4.1	2.1	0.7
1983	11,010	7,710	1,880	716	421	214	71	70.0	17.1	6.5	3.8	1.9	0.6
1984	11,137	7,941	1,761	764	427	180	64	71.3	15.8	6.9	3.8	1.6	0.6
1985	11,585	8,137	1,951	794	418	217	68	70.2	16.8	6.9	3.6	1.9	0.6
1986	12,313	8,734	2,101	734	491	189	66	70.9	17.1	6.0	4.0	1.5	0.5
1987	11,827	8,455	2,010	694	439	182	48	71.5	17.0	5.9	3.7	1.5	0.4
1988	12,384	8,867	2,051	726	477	202	62	71.6	16.6	5.9	3.9	1.6	0.5
1989	12,405	9,025	1,960	685	489	190	55	72.8	15.8	5.5	3.9	1.5	0.4
1990	12,719	9,272	2,054	666	470	182	75	72.9	16.1	5.2	3.7	1.4	0.6
1991	13,086	9,446	2,122	699	485	239	95	72.2	16.2	5.3	3.7	1.8	0.7
1992	12,926	9,561	1,981	686	435	195	69	74.0	15.3	5.3	3.4	1.5	0.5
1993	13,252	9,789	2,045	633	443	272	70	73.9	15.4	4.8	3.3	2.1	0.5

(continued)

Appendix table 5-36.

Articles in U.S. natural science and engineering journals, by sector and field: 1981–93
 (page 3 of 5)

	All sectors	Academic institutions	Industry	Federal Government	FFRDCs	Nonprofit institutions	Other	Academic institutions	Industry	Federal Government	FFRDCs	Nonprofit institutions	Other
	Number						Percent						
	Physics												
1981	13,053	8,123	2,135	835	1,754	180	28	62.2	16.4	6.4	13.4	1.4	0.2
1982	13,255	8,195	2,224	848	1,748	202	38	61.8	16.8	6.4	13.2	1.5	0.3
1983	13,021	8,197	2,086	760	1,727	200	51	63.0	16.0	5.8	13.3	1.5	0.4
1984	12,691	8,118	2,007	754	1,567	199	47	64.0	15.8	5.9	12.3	1.6	0.4
1985	15,903	9,802	2,823	933	2,054	234	56	61.6	17.8	5.9	12.9	1.5	0.4
1986	16,360	10,129	2,881	917	2,195	206	33	61.9	17.6	5.6	13.4	1.3	0.2
1987	16,078	10,209	2,739	854	2,006	229	42	63.5	17.0	5.3	12.5	1.4	0.3
1988	17,499	11,111	3,024	936	2,159	231	37	63.5	17.3	5.3	12.3	1.3	0.2
1989	17,649	11,392	2,915	949	2,107	245	41	64.5	16.5	5.4	11.9	1.4	0.2
1990	17,241	11,112	2,939	905	2,008	236	41	64.5	17.0	5.2	11.6	1.4	0.2
1991	18,077	11,866	2,889	1,000	2,018	249	57	65.6	16.0	5.5	11.2	1.4	0.3
1992	17,847	11,814	2,812	1,026	1,919	214	62	66.2	15.8	5.7	10.8	1.2	0.3
1993	16,912	11,641	2,241	990	1,757	216	68	68.8	13.3	5.9	10.4	1.3	0.4
	Earth and space sciences												
1981	7,258	4,710	408	1,164	562	315	97	64.9	5.6	16.0	7.7	4.3	1.3
1982	7,057	4,529	461	1,092	554	312	109	64.2	6.5	15.5	7.9	4.4	1.5
1983	6,862	4,371	448	1,091	519	330	104	63.7	6.5	15.9	7.6	4.8	1.5
1984	6,748	4,329	447	1,062	523	296	92	64.2	6.6	15.7	7.8	4.4	1.4
1985	7,663	4,795	598	1,197	534	364	177	62.6	7.8	15.6	7.0	4.8	2.3
1986	7,811	4,985	580	1,206	579	285	178	63.8	7.4	15.4	7.4	3.6	2.3
1987	7,797	4,984	587	1,169	568	323	166	63.9	7.5	15.0	7.3	4.1	2.1
1988	7,653	4,916	516	1,120	526	418	157	64.2	6.7	14.6	6.9	5.5	2.1
1989	7,770	4,954	565	1,112	535	429	176	63.8	7.3	14.3	6.9	5.5	2.3
1990	7,716	4,941	481	1,147	548	457	142	64.0	6.2	14.9	7.1	5.9	1.8
1991	8,138	5,155	605	1,149	569	471	189	63.3	7.4	14.1	7.0	5.8	2.3
1992	8,233	5,363	596	1,149	552	416	159	65.1	7.2	14.0	6.7	5.1	1.9
1993	8,522	5,632	522	1,186	561	453	170	66.1	6.1	13.9	6.6	5.3	2.0

(continued)

Appendix table 5-36.

Articles in U.S. natural science and engineering journals, by sector and field: 1981–93
(page 4 of 5)

	All sectors	Academic institutions	Industry	Federal Government	FFRDCs	Nonprofit institutions	Other	Academic institutions	Industry	Federal Government	FFRDCs	Nonprofit institutions	Other
	Number						Percent						
Engineering and technology													
1981	12,486	5,555	4,191	1,009	1,220	283	229	44.5	33.6	8.1	9.8	2.3	1.8
1982	11,619	5,518	3,778	926	974	220	202	47.5	32.5	8.0	8.4	1.9	1.7
1983	13,104	5,936	4,419	1,071	1,253	270	157	45.3	33.7	8.2	9.6	2.1	1.2
1984	11,976	5,830	3,870	999	874	256	149	48.7	32.3	8.3	7.3	2.1	1.2
1985	10,822	5,442	3,081	847	1,152	198	103	50.3	28.5	7.8	10.6	1.8	1.0
1986	9,774	5,369	2,579	790	776	180	81	54.9	26.4	8.1	7.9	1.8	0.8
1987	9,225	5,291	2,165	630	921	151	67	57.4	23.5	6.8	10.0	1.6	0.7
1988	9,488	5,537	2,336	660	698	171	86	58.4	24.6	7.0	7.4	1.8	0.9
1989	9,568	5,676	2,266	678	714	169	65	59.3	23.7	7.1	7.5	1.8	0.7
1990	10,113	6,084	2,402	694	677	159	98	60.2	23.8	6.9	6.7	1.6	1.0
1991	9,999	5,979	2,441	715	608	153	104	59.8	24.4	7.2	6.1	1.5	1.0
1992	10,833	6,634	2,333	809	777	176	105	61.2	21.5	7.5	7.2	1.6	1.0
1993	10,051	6,185	2,242	736	601	158	130	61.5	22.3	7.3	6.0	1.6	1.3
Mathematics													
1981	3,943	3,579	151	87	55	61	11	90.8	3.8	2.2	1.4	1.5	0.3
1982	3,697	3,301	158	110	50	71	7	89.3	4.3	3.0	1.4	1.9	0.2
1983	3,649	3,307	166	62	47	63	5	90.6	4.5	1.7	1.3	1.7	0.1
1984	3,462	3,116	138	90	49	65	7	90.0	4.0	2.6	1.4	1.9	0.2
1985	3,659	3,254	176	111	44	63	11	88.9	4.8	3.0	1.2	1.7	0.3
1986	3,109	2,811	121	68	56	49	4	90.4	3.9	2.2	1.8	1.6	0.1
1987	2,893	2,580	130	68	53	57	6	89.2	4.5	2.4	1.8	2.0	0.2
1988	3,745	3,388	154	88	53	51	11	90.5	4.1	2.3	1.4	1.4	0.3
1989	3,664	3,367	126	67	52	40	12	91.9	3.4	1.8	1.4	1.1	0.3
1990	3,040	2,736	117	80	39	56	12	90.0	3.8	2.6	1.3	1.8	0.4
1991	3,111	2,849	95	60	46	50	12	91.6	3.1	1.9	1.5	1.6	0.4
1992	3,165	2,889	130	47	37	55	7	91.3	4.1	1.5	1.2	1.7	0.2
1993	3,170	2,875	119	74	45	49	7	90.7	3.8	2.3	1.4	1.5	0.2

(continued)

Appendix table 5-36.

Articles in U.S. natural science and engineering journals, by sector and field: 1981–93
 (page 5 of 5)

	All sectors	Academic institutions	Industry	Federal Government	FFRDCs	Nonprofit institutions	Other	Academic institutions	Industry	Federal Government	FFRDCs	Nonprofit institutions	Other
	Number						Percent						
	All natural science and engineering fields												
1981	132,280	90,411	11,140	13,098	4,791	9,959	2,882	68.3	8.4	9.9	3.6	7.5	2.2
1982	133,624	92,336	11,039	13,084	4,511	9,765	2,889	69.1	8.3	9.8	3.4	7.3	2.2
1983	132,414	90,555	11,759	12,879	4,627	9,932	2,663	68.4	8.9	9.7	3.5	7.5	2.0
1984	131,111	90,455	11,266	12,825	4,053	9,864	2,651	69.0	8.6	9.8	3.1	7.5	2.0
1985	137,913	95,439	11,774	12,903	4,918	10,214	2,668	69.2	8.5	9.4	3.6	7.4	1.9
1986	137,869	95,880	11,878	12,897	4,760	9,912	2,543	69.5	8.6	9.4	3.5	7.2	1.8
1987	134,498	94,424	11,273	12,255	4,620	9,546	2,383	70.2	8.4	9.1	3.4	7.1	1.8
1988	138,141	97,176	11,852	12,298	4,592	9,983	2,240	70.3	8.6	8.9	3.3	7.2	1.6
1989	140,832	99,215	11,963	12,372	4,532	10,360	2,390	70.4	8.5	8.8	3.2	7.4	1.7
1990	140,993	99,499	12,295	12,378	4,402	10,065	2,354	70.6	8.7	8.8	3.1	7.1	1.7
1991	142,332	100,275	12,660	12,265	4,391	10,242	2,498	70.5	8.9	8.6	3.1	7.2	1.8
1992	143,173	101,780	12,421	11,986	4,319	10,149	2,520	71.1	8.7	8.4	3.0	7.1	1.8
1993	140,587	100,050	11,755	11,796	3,986	10,499	2,502	71.2	8.4	8.4	2.8	7.5	1.8

FFRDC = federally funded research and development center

NOTE: In this table, multi-author papers with authors' institutional affiliations in different sectors have been prorated; e.g., a two-author paper with an academic and an industry author is counted as one-half paper in each sector.

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF, special tabulations.

See figure 5-26.

Science and Engineering Indicators – 1996

Appendix table 5-37.

Intersectoral coauthorship of U.S. natural science and engineering articles: 1981–93
 (page 1 of 3)

	All articles	Articles coauthored with													
		Number							Percent						
		All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other
Academic institutions															
1981	104,112	21,192	NA	2,905	8,138	2,072	7,352	2,384	20.4	NA	2.8	7.8	2.0	7.1	2.3
1982	106,657	21,938	NA	3,297	8,285	2,095	7,627	2,550	20.6	NA	3.1	7.8	2.0	7.2	2.4
1983	105,246	22,025	NA	3,386	8,234	2,160	7,798	2,429	20.9	NA	3.2	7.8	2.1	7.4	2.3
1984	105,598	22,424	NA	3,584	8,451	2,186	7,718	2,444	21.2	NA	3.4	8.0	2.1	7.3	2.3
1985	111,690	23,753	NA	4,063	8,694	2,406	8,326	2,461	21.3	NA	3.6	7.8	2.2	7.5	2.2
1986	112,639	24,388	NA	4,283	9,117	2,637	8,298	2,515	21.7	NA	3.8	8.1	2.3	7.4	2.2
1987	111,435	24,582	NA	4,598	9,104	2,684	8,286	2,477	22.1	NA	4.1	8.2	2.4	7.4	2.2
1988	115,109	25,526	NA	5,021	9,334	2,828	8,729	2,451	22.2	NA	4.4	8.1	2.5	7.6	2.1
1989	117,763	26,017	NA	5,301	9,163	2,783	9,005	2,633	22.1	NA	4.5	7.8	2.4	7.6	2.2
1990	118,831	26,733	NA	5,728	9,502	2,958	9,089	2,658	22.5	NA	4.8	8.0	2.5	7.6	2.2
1991	120,663	27,304	NA	6,199	9,334	3,054	9,237	2,806	22.6	NA	5.1	7.7	2.5	7.7	2.3
1992	123,457	28,333	NA	6,588	9,642	3,300	9,490	3,115	22.9	NA	5.3	7.8	2.7	7.7	2.5
1993	121,869	28,167	NA	6,611	9,626	3,282	9,537	2,932	23.1	NA	5.4	7.9	2.7	7.8	2.4
Industry															
1981	13,462	3,671	2,905	NA	639	248	296	172	27.3	21.6	NA	4.7	1.8	2.2	1.3
1982	13,705	4,166	3,297	NA	760	268	364	200	30.4	24.1	NA	5.5	2.0	2.7	1.5
1983	14,598	4,434	3,386	NA	837	352	404	235	30.4	23.2	NA	5.7	2.4	2.8	1.6
1984	14,220	4,590	3,584	NA	830	362	440	197	32.3	25.2	NA	5.8	2.5	3.1	1.4
1985	15,127	5,150	4,063	NA	901	380	514	241	34.0	26.9	NA	6.0	2.5	3.4	1.6
1986	15,453	5,455	4,283	NA	1,012	455	549	266	35.3	27.7	NA	6.5	2.9	3.6	1.7
1987	15,092	5,738	4,598	NA	1,029	417	639	266	38.0	30.5	NA	6.8	2.8	4.2	1.8
1988	15,997	6,271	5,021	NA	1,140	475	680	269	39.2	31.4	NA	7.1	3.0	4.3	1.7
1989	16,410	6,633	5,301	NA	1,215	455	814	311	40.4	32.3	NA	7.4	2.8	5.0	1.9
1990	17,142	7,144	5,728	NA	1,275	564	843	360	41.7	33.4	NA	7.4	3.3	4.9	2.1
1991	17,914	7,607	6,199	NA	1,358	518	878	379	42.5	34.6	NA	7.6	2.9	4.9	2.1
1992	18,067	8,168	6,588	NA	1,490	588	1,029	479	45.2	36.5	NA	8.2	3.3	5.7	2.7
1993	17,469	8,202	6,611	NA	1,565	550	1,094	464	47.0	37.8	NA	9.0	3.1	6.3	2.7

(continued)

Appendix table 5-37.

Intersectoral coauthorship of U.S. natural science and engineering articles: 1981–93

(page 2 of 3)

	Articles coauthored with														
	All articles	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other
	Number								Percent						
Federal Government															
1981	18,592	9,178	8,138	639	NA	265	818	423	49.4	43.8	3.4	NA	1.4	4.4	2.3
1982	18,685	9,321	8,285	760	NA	240	815	479	49.9	44.3	4.1	NA	1.3	4.4	2.6
1983	18,543	9,367	8,234	837	NA	272	838	441	50.5	44.4	4.5	NA	1.5	4.5	2.4
1984	18,654	9,530	8,451	830	NA	294	800	452	51.1	45.3	4.4	NA	1.6	4.3	2.4
1985	19,036	9,906	8,694	901	NA	303	961	508	52.0	45.7	4.7	NA	1.6	5.0	2.7
1986	19,319	10,372	9,117	1,012	NA	373	981	535	53.7	47.2	5.2	NA	1.9	5.1	2.8
1987	18,725	10,313	9,104	1,029	NA	331	985	529	55.1	48.6	5.5	NA	1.8	5.3	2.8
1988	19,030	10,588	9,334	1,140	NA	382	1,090	499	55.6	49.0	6.0	NA	2.0	5.7	2.6
1989	19,115	10,544	9,163	1,215	NA	427	1,067	481	55.2	47.9	6.4	NA	2.2	5.6	2.5
1990	19,387	10,900	9,502	1,275	NA	443	1,148	536	56.2	49.0	6.6	NA	2.3	5.9	2.8
1991	19,349	10,814	9,334	1,358	NA	419	1,173	552	55.9	48.2	7.0	NA	2.2	6.1	2.9
1992	19,354	11,177	9,642	1,490	NA	466	1,245	641	57.8	49.8	7.7	NA	2.4	6.4	3.3
1993	19,283	11,190	9,626	1,565	NA	438	1,224	691	58.0	49.9	8.1	NA	2.3	6.3	3.6
FFRDCs															
1981	6,393	2,473	2,072	248	265	NA	85	21	38.7	32.4	3.9	4.1	NA	1.3	0.3
1982	6,186	2,510	2,095	268	240	NA	107	20	40.6	33.9	4.3	3.9	NA	1.7	0.3
1983	6,417	2,682	2,160	352	272	NA	107	41	41.8	33.7	5.5	4.2	NA	1.7	0.6
1984	5,884	2,709	2,186	362	294	NA	125	34	46.0	37.2	6.2	5.0	NA	2.1	0.6
1985	6,952	2,995	2,406	380	303	NA	132	29	43.1	34.6	5.5	4.4	NA	1.9	0.4
1986	6,981	3,277	2,637	455	373	NA	106	32	46.9	37.8	6.5	5.3	NA	1.5	0.5
1987	6,889	3,250	2,684	417	331	NA	129	35	47.2	39.0	6.1	4.8	NA	1.9	0.5
1988	6,987	3,444	2,828	475	382	NA	154	39	49.3	40.5	6.8	5.5	NA	2.2	0.6
1989	6,943	3,431	2,783	455	427	NA	164	38	49.4	40.1	6.6	6.2	NA	2.4	0.5
1990	6,933	3,593	2,958	564	443	NA	193	46	51.8	42.7	8.1	6.4	NA	2.8	0.7
1991	7,042	3,714	3,054	518	419	NA	207	37	52.7	43.4	7.4	6.0	NA	2.9	0.5
1992	7,217	4,020	3,300	588	466	NA	216	64	55.7	45.7	8.1	6.5	NA	3.0	0.9
1993	6,874	3,948	3,282	550	438	NA	198	48	57.4	47.7	8.0	6.4	NA	2.9	0.7

(continued)

Appendix table 5-37.

Intersectoral coauthorship of U.S. natural science and engineering articles: 1981–93

(page 3 of 3)

	All articles	Articles coauthored with													
		Number							Percent						
		All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other
Nonprofit institutions															
1981	14,624	8,035	7,352	296	818	85	NA	486	54.9	50.3	2.0	5.6	0.6	NA	3.3
1982	14,597	8,279	7,627	364	815	107	NA	519	56.7	52.3	2.5	5.6	0.7	NA	3.6
1983	14,919	8,472	7,798	404	838	107	NA	519	56.8	52.3	2.7	5.6	0.7	NA	3.5
1984	14,862	8,410	7,718	440	800	125	NA	500	56.6	51.9	3.0	5.4	0.8	NA	3.4
1985	15,664	9,097	8,326	514	961	132	NA	547	58.1	53.2	3.3	6.1	0.8	NA	3.5
1986	15,389	9,039	8,298	549	981	106	NA	593	58.7	53.9	3.6	6.4	0.7	NA	3.9
1987	15,077	9,007	8,286	639	985	129	NA	515	59.7	55.0	4.2	6.5	0.9	NA	3.4
1988	15,882	9,551	8,729	680	1,090	154	NA	593	60.1	55.0	4.3	6.9	1.0	NA	3.7
1989	16,507	9,880	9,005	814	1,067	164	NA	589	59.9	54.6	4.9	6.5	1.0	NA	3.6
1990	16,359	9,979	9,089	843	1,148	193	NA	652	61.0	55.6	5.2	7.0	1.2	NA	4.0
1991	16,702	10,205	9,237	878	1,173	207	NA	767	61.1	55.3	5.3	7.0	1.2	NA	4.6
1992	16,867	10,456	9,490	1,029	1,245	216	NA	802	62.0	56.3	6.1	7.4	1.3	NA	4.8
1993	17,310	10,539	9,537	1,094	1,224	198	NA	861	60.9	55.1	6.3	7.1	1.1	NA	5.0
Other sectors															
1981	4,602	2,864	2,384	172	423	21	486	NA	62.2	51.8	3.7	9.2	0.5	10.6	NA
1982	4,742	3,044	2,550	200	479	20	519	NA	64.2	53.8	4.2	10.1	0.4	10.9	NA
1983	4,468	2,927	2,429	235	441	41	519	NA	65.5	54.4	5.3	9.9	0.9	11.6	NA
1984	4,454	2,918	2,444	197	452	34	500	NA	65.5	54.9	4.4	10.1	0.8	11.2	NA
1985	4,529	3,003	2,461	241	508	29	547	NA	66.3	54.3	5.3	11.2	0.6	12.1	NA
1986	4,471	3,072	2,515	266	535	32	593	NA	68.7	56.3	5.9	12.0	0.7	13.3	NA
1987	4,239	2,956	2,477	266	529	35	515	NA	69.7	58.4	6.3	12.5	0.8	12.1	NA
1988	4,073	2,910	2,451	269	499	39	593	NA	71.4	60.2	6.6	12.3	1.0	14.6	NA
1989	4,404	3,163	2,633	311	481	38	589	NA	71.8	59.8	7.1	10.9	0.9	13.4	NA
1990	4,374	3,180	2,658	360	536	46	652	NA	72.7	60.8	8.2	12.3	1.1	14.9	NA
1991	4,686	3,368	2,806	379	552	37	767	NA	71.9	59.9	8.1	11.8	0.8	16.4	NA
1992	4,970	3,726	3,115	479	641	64	802	NA	75.0	62.7	9.6	12.9	1.3	16.1	NA
1993	4,894	3,591	2,932	464	691	48	861	NA	73.4	59.9	9.5	14.1	1.0	17.6	NA

NA = not applicable; FFRDC = federally funded research and development center

NOTE: In this table, an article is counted in a given sector if at least one author's affiliation is with that sector. Since some articles have authors from more than two sectors, the "all sectors" total is smaller than the sum of the sectors.

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF special tabulations.

Science and Engineering Indicators – 1996

Appendix table 5-38.

Intersectoral coauthorship of U.S. articles, by selected field groupings: 1981–93

(page 1 of 7)

	All articles	Articles coauthored with													
		All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other
		Number							Percent						
Clinical medicine, biomedical research, and biology															
Academic institutions															
1981	70,177	16,072	NA	1,088	6,797	370	6,875	2,190	22.9	NA	1.6	9.7	0.5	9.8	3.1
1982	72,390	16,657	NA	1,319	6,922	391	7,116	2,363	23.0	NA	1.8	9.6	0.5	9.8	3.3
1983	71,013	16,505	NA	1,323	6,809	359	7,281	2,290	23.2	NA	1.9	9.6	0.5	10.3	3.2
1984	71,367	16,893	NA	1,520	6,993	367	7,220	2,291	23.7	NA	2.1	9.8	0.5	10.1	3.2
1985	74,964	17,795	NA	1,856	7,148	416	7,830	2,365	23.7	NA	2.5	9.5	0.6	10.4	3.2
1986	75,125	18,199	NA	2,021	7,493	455	7,841	2,462	24.2	NA	2.7	10.0	0.6	10.4	3.3
1987	74,289	18,200	NA	2,244	7,516	438	7,740	2,404	24.5	NA	3.0	10.1	0.6	10.4	3.2
1988	75,134	18,595	NA	2,402	7,531	437	8,091	2,359	24.7	NA	3.2	10.0	0.6	10.8	3.1
1989	77,069	19,187	NA	2,659	7,506	454	8,329	2,517	24.9	NA	3.5	9.7	0.6	10.8	3.3
1990	77,935	19,221	NA	2,865	7,550	503	8,309	2,487	24.7	NA	3.7	9.7	0.6	10.7	3.2
1991	77,971	19,430	NA	3,111	7,372	525	8,403	2,663	24.9	NA	4.0	9.5	0.7	10.8	3.4
1992	79,084	19,978	NA	3,307	7,477	539	8,693	2,922	25.3	NA	4.2	9.5	0.7	11.0	3.7
1993	77,571	19,809	NA	3,463	7,355	520	8,720	2,726	25.5	NA	4.5	9.5	0.7	11.2	3.5
Industry															
1981	3,320	1,365	1,088	NA	249	39	219	99	41.1	32.8	NA	7.5	1.2	6.6	3.0
1982	3,614	1,643	1,319	NA	319	27	264	126	45.5	36.5	NA	8.8	0.7	7.3	3.5
1983	3,860	1,712	1,323	NA	358	41	315	141	44.4	34.3	NA	9.3	1.1	8.2	3.7
1984	4,288	1,937	1,520	NA	366	40	345	130	45.2	35.4	NA	8.5	0.9	8.0	3.0
1985	4,654	2,280	1,856	NA	443	55	375	155	49.0	39.9	NA	9.5	1.2	8.1	3.3
1986	5,307	2,537	2,021	NA	519	82	457	189	47.8	38.1	NA	9.8	1.5	8.6	3.6
1987	5,495	2,753	2,244	NA	528	73	529	193	50.1	40.8	NA	9.6	1.3	9.6	3.5
1988	5,779	2,957	2,402	NA	576	72	551	200	51.2	41.6	NA	10.0	1.2	9.5	3.5
1989	6,398	3,288	2,659	NA	619	87	690	221	51.4	41.6	NA	9.7	1.4	10.8	3.5
1990	6,762	3,534	2,865	NA	660	97	725	282	52.3	42.4	NA	9.8	1.4	10.7	4.2
1991	7,142	3,743	3,111	NA	692	83	732	274	52.4	43.6	NA	9.7	1.2	10.2	3.8
1992	7,456	4,029	3,307	NA	755	106	884	333	54.0	44.4	NA	10.1	1.4	11.9	4.5
1993	7,609	4,180	3,463	NA	784	96	941	327	54.9	45.5	NA	10.3	1.3	12.4	4.3
Federal Government															
1981	13,705	7,399	6,797	249	NA	87	739	374	54.0	49.6	1.8	NA	0.6	5.4	2.7
1982	13,735	7,510	6,922	319	NA	74	725	437	54.7	50.4	2.3	NA	0.5	5.3	3.2
1983	13,632	7,440	6,809	358	NA	78	764	394	54.6	49.9	2.6	NA	0.6	5.6	2.9
1984	13,755	7,584	6,993	366	NA	80	718	410	55.1	50.8	2.7	NA	0.6	5.2	3.0
1985	13,862	7,849	7,148	443	NA	118	849	465	56.6	51.6	3.2	NA	0.9	6.1	3.4
1986	14,226	8,215	7,493	519	NA	155	885	480	57.7	52.7	3.6	NA	1.1	6.2	3.4
1987	13,954	8,191	7,516	528	NA	131	883	466	58.7	53.9	3.8	NA	0.9	6.3	3.3

(continued)

Appendix table 5-38.

Intersectoral coauthorship of U.S. articles, by selected field groupings: 1981–93

(page 2 of 7)

	All articles	Articles coauthored with													
		Number							Percent						
		All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other
Clinical medicine, biomedical research, and biology															
1988	14,008	8,229	7,531	576	NA	137	953	448	58.7	53.8	4.1	NA	1.0	6.8	3.2
1989	14,162	8,276	7,506	619	NA	163	947	431	58.4	53.0	4.4	NA	1.2	6.7	3.0
1990	14,227	8,338	7,550	660	NA	155	1,003	474	58.6	53.1	4.6	NA	1.1	7.0	3.3
1991	13,981	8,205	7,372	692	NA	161	1,012	478	58.7	52.7	4.9	NA	1.2	7.2	3.4
1992	13,721	8,299	7,477	755	NA	131	1,087	562	60.5	54.5	5.5	NA	1.0	7.9	4.1
1993	13,651	8,189	7,355	784	NA	142	1,030	595	60.0	53.9	5.7	NA	1.0	7.5	4.4
FFRDCs															
1981	1,053	474	370	39	87	NA	43	11	45.0	35.1	3.7	8.3	NA	4.1	1.0
1982	1,001	472	391	27	74	NA	48	8	47.2	39.1	2.7	7.4	NA	4.8	0.8
1983	953	451	359	41	78	NA	60	18	47.3	37.7	4.3	8.2	NA	6.3	1.9
1984	911	464	367	40	80	NA	58	17	50.9	40.3	4.4	8.8	NA	6.4	1.9
1985	1,068	557	416	55	118	NA	71	19	52.2	39.0	5.1	11.0	NA	6.6	1.8
1986	1,057	600	455	82	155	NA	45	17	56.8	43.0	7.8	14.7	NA	4.3	1.6
1987	1,016	576	438	73	131	NA	55	17	56.7	43.1	7.2	12.9	NA	5.4	1.7
1988	1,056	574	437	72	137	NA	61	14	54.4	41.4	6.8	13.0	NA	5.8	1.3
1989	1,053	603	454	87	163	NA	58	21	57.3	43.1	8.3	15.5	NA	5.5	2.0
1990	1,105	662	503	97	155	NA	78	21	59.9	45.5	8.8	14.0	NA	7.1	1.9
1991	1,135	682	525	83	161	NA	93	18	60.1	46.3	7.3	14.2	NA	8.2	1.6
1992	1,079	691	539	106	131	NA	85	16	64.0	50.0	9.8	12.1	NA	7.9	1.5
1993	1,061	692	520	96	142	NA	77	16	65.2	49.0	9.0	13.4	NA	7.3	1.5
Nonprofit institutions															
1981	13,168	7,442	6,875	219	739	43	NA	476	56.5	52.2	1.7	5.6	0.3	NA	3.6
1982	13,117	7,619	7,116	264	725	48	NA	501	58.1	54.3	2.0	5.5	0.4	NA	3.8
1983	13,417	7,831	7,281	315	764	60	NA	507	58.4	54.3	2.3	5.7	0.4	NA	3.8
1984	13,434	7,774	7,220	345	718	58	NA	494	57.9	53.7	2.6	5.3	0.4	NA	3.7
1985	14,116	8,427	7,830	375	849	71	NA	534	59.7	55.5	2.7	6.0	0.5	NA	3.8
1986	14,061	8,448	7,841	457	885	45	NA	583	60.1	55.8	3.3	6.3	0.3	NA	4.1
1987	13,644	8,320	7,740	529	883	55	NA	508	61.0	56.7	3.9	6.5	0.4	NA	3.7
1988	14,205	8,724	8,091	551	953	61	NA	579	61.4	57.0	3.9	6.7	0.4	NA	4.1
1989	14,812	9,021	8,329	690	947	58	NA	567	60.9	56.2	4.7	6.4	0.4	NA	3.8
1990	14,565	9,008	8,309	725	1,003	78	NA	625	61.8	57.0	5.0	6.9	0.5	NA	4.3
1991	14,777	9,164	8,403	732	1,012	93	NA	741	62.0	56.9	5.0	6.8	0.6	NA	5.0
1992	15,087	9,450	8,693	884	1,087	85	NA	772	62.6	57.6	5.9	7.2	0.6	NA	5.1
1993	15,391	9,484	8,720	941	1,030	77	NA	829	61.6	56.7	6.1	6.7	0.5	NA	5.4
Other sectors															
1981	4,015	2,611	2,216	99	374	11	476	NA	65.0	55.2	2.5	9.3	0.3	11.9	NA
1982	4,146	2,792	2,379	126	437	8	501	NA	67.3	57.4	3.0	10.5	0.2	12.1	NA
1983	3,885	2,630	2,234	141	394	18	507	NA	67.7	57.5	3.6	10.1	0.5	13.1	NA
1984	3,916	2,654	2,256	130	410	17	494	NA	67.8	57.6	3.3	10.5	0.4	12.6	NA

(continued)

Appendix table 5-38.

Intersectoral coauthorship of U.S. articles, by selected field groupings: 1981–93

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	Articles coauthored with														
	All articles	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other
	Number								Percent						
Clinical medicine, biomedical research, and biology															
1985	3,926	2,709	2,266	155	465	19	534	NA	69.0	57.7	3.9	11.8	0.5	13.6	NA
1986	3,927	2,773	2,312	189	480	17	583	NA	70.6	58.9	4.8	12.2	0.4	14.8	NA
1987	3,722	2,651	2,266	193	466	17	508	NA	71.2	60.9	5.2	12.5	0.5	13.6	NA
1988	3,547	2,637	2,268	200	448	14	579	NA	74.3	63.9	5.6	12.6	0.4	16.3	NA
1989	3,863	2,859	2,441	221	431	21	567	NA	74.0	63.2	5.7	11.2	0.5	14.7	NA
1990	3,790	2,833	2,409	282	474	21	625	NA	74.7	63.6	7.4	12.5	0.6	16.5	NA
1991	3,974	2,973	2,521	274	478	18	741	NA	74.8	63.4	6.9	12.0	0.5	18.6	NA
1992	4,279	3,265	2,808	333	562	16	772	NA	76.3	65.6	7.8	13.1	0.4	18.0	NA
1993	4,131	3,111	2,617	327	595	16	829	NA	75.3	63.4	7.9	14.4	0.4	20.1	NA
Chemistry, physics, earth and space sciences, and mathematics															
Academic institutions															
1981	27,465	3,824	NA	1,073	1,082	1,443	409	97	13.9	NA	3.9	3.9	5.3	1.5	0.4
1982	27,851	3,997	NA	1,246	1,094	1,472	437	106	14.4	NA	4.5	3.9	5.3	1.6	0.4
1983	27,271	4,109	NA	1,253	1,114	1,525	458	134	15.1	NA	4.6	4.1	5.6	1.7	0.5
1984	27,437	4,183	NA	1,307	1,141	1,575	433	128	15.2	NA	4.8	4.2	5.7	1.6	0.5
1985	30,381	4,791	NA	1,562	1,273	1,734	445	159	15.8	NA	5.1	4.2	5.7	1.5	0.5
1986	31,238	5,040	NA	1,633	1,341	1,932	404	177	16.1	NA	5.2	4.3	6.2	1.3	0.6
1987	30,954	5,235	NA	1,737	1,305	2,005	487	163	16.9	NA	5.6	4.2	6.5	1.6	0.5
1988	33,457	5,669	NA	1,943	1,495	2,121	567	143	16.9	NA	5.8	4.5	6.3	1.7	0.4
1989	34,037	5,623	NA	1,998	1,380	2,051	615	162	16.5	NA	5.9	4.1	6.0	1.8	0.5
1990	33,682	6,076	NA	2,066	1,608	2,176	701	189	18.0	NA	6.1	4.8	6.5	2.1	0.6
1991	35,578	6,445	NA	2,278	1,629	2,247	769	239	18.1	NA	6.4	4.6	6.3	2.2	0.7
1992	36,420	6,679	NA	2,366	1,748	2,383	727	246	18.3	NA	6.5	4.8	6.5	2.0	0.7
1993	36,894	6,845	NA	2,330	1,889	2,465	749	235	18.6	NA	6.3	5.1	6.7	2.0	0.6
Industry															
1981	5,372	1,318	867	NA	216	121	31	27	24.5	16.1	NA	4.0	2.3	0.6	0.5
1982	5,736	1,570	971	NA	303	156	37	33	27.4	16.9	NA	5.3	2.7	0.6	0.6
1983	5,665	1,618	1,005	NA	267	179	48	53	28.6	17.7	NA	4.7	3.2	0.8	0.9
1984	5,447	1,650	1,066	NA	290	209	44	45	30.3	19.6	NA	5.3	3.8	0.8	0.8
1985	6,861	1,994	1,287	NA	318	216	66	66	29.1	18.8	NA	4.6	3.1	1.0	1.0
1986	7,061	2,095	1,342	NA	346	236	62	67	29.7	19.0	NA	4.9	3.3	0.9	0.9
1987	6,962	2,220	1,408	NA	353	267	67	63	31.9	20.2	NA	5.1	3.8	1.0	0.9
1988	7,364	2,463	1,581	NA	402	308	73	66	33.4	21.5	NA	5.5	4.2	1.0	0.9
1989	7,246	2,524	1,616	NA	437	267	87	82	34.8	22.3	NA	6.0	3.7	1.2	1.1

(continued)

Appendix table 5-38.

Intersectoral coauthorship of U.S. articles, by selected field groupings: 1981–93

(page 4 of 7)

	All articles	Articles coauthored with													
		All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other
		Number							Percent						
Chemistry, physics, earth and space sciences, and mathematics															
1990	7,365	2,617	1,661	NA	434	340	78	71	35.5	22.6	NA	5.9	4.6	1.1	1.0
1991	7,687	2,869	1,830	NA	480	339	108	76	37.3	23.8	NA	6.2	4.4	1.4	1.0
1992	7,551	2,972	1,933	NA	507	353	89	105	39.4	25.6	NA	6.7	4.7	1.2	1.4
1993	6,962	2,959	1,861	NA	568	337	104	91	42.5	26.7	NA	8.2	4.8	1.5	1.3
Federal Government															
1981	3,632	1,353	1,082	231	NA	145	64	27	37.3	29.8	6.4	NA	4.0	1.8	0.7
1982	3,798	1,416	1,094	316	NA	146	72	29	37.3	28.8	8.3	NA	3.8	1.9	0.8
1983	3,553	1,431	1,114	292	NA	151	60	36	40.3	31.4	8.2	NA	4.2	1.7	1.0
1984	3,635	1,477	1,141	315	NA	185	68	37	40.6	31.4	8.7	NA	5.1	1.9	1.0
1985	4,088	1,645	1,273	335	NA	146	88	33	40.2	31.1	8.2	NA	3.6	2.2	0.8
1986	4,061	1,758	1,341	372	NA	187	87	49	43.3	33.0	9.2	NA	4.6	2.1	1.2
1987	3,904	1,730	1,305	380	NA	173	92	56	44.3	33.4	9.7	NA	4.4	2.4	1.4
1988	4,116	1,942	1,495	443	NA	222	122	41	47.2	36.3	10.8	NA	5.4	3.0	1.0
1989	4,040	1,867	1,380	474	NA	229	110	45	46.2	34.2	11.7	NA	5.7	2.7	1.1
1990	4,186	2,092	1,608	468	NA	250	138	54	50.0	38.4	11.2	NA	6.0	3.3	1.3
1991	4,372	2,167	1,629	529	NA	244	149	68	49.6	37.3	12.1	NA	5.6	3.4	1.6
1992	4,476	2,294	1,748	546	NA	291	139	64	51.3	39.1	12.2	NA	6.5	3.1	1.4
1993	4,559	2,443	1,889	602	NA	264	165	79	53.6	41.4	13.2	NA	5.8	3.6	1.7
FFRDCs															
1981	3,900	1,644	1,443	118	145	NA	34	8	42.2	37.0	3.0	3.7	NA	0.9	0.2
1982	4,003	1,705	1,472	159	146	NA	51	10	42.6	36.8	4.0	3.6	NA	1.3	0.2
1983	3,947	1,788	1,525	195	151	NA	41	18	45.3	38.6	4.9	3.8	NA	1.0	0.5
1984	3,859	1,859	1,575	214	185	NA	54	14	48.2	40.8	5.5	4.8	NA	1.4	0.4
1985	4,476	2,024	1,734	213	146	NA	53	6	45.2	38.7	4.8	3.3	NA	1.2	0.1
1986	4,899	2,280	1,932	256	187	NA	51	11	46.5	39.4	5.2	3.8	NA	1.0	0.2
1987	4,733	2,346	2,005	280	173	NA	67	12	49.6	42.4	5.9	3.7	NA	1.4	0.3
1988	4,991	2,500	2,121	326	222	NA	79	20	50.1	42.5	6.5	4.4	NA	1.6	0.4
1989	4,923	2,443	2,051	295	229	NA	96	14	49.6	41.7	6.0	4.7	NA	2.0	0.3
1990	4,906	2,544	2,176	363	250	NA	100	18	51.9	44.4	7.4	5.1	NA	2.0	0.4
1991	5,022	2,642	2,247	355	244	NA	103	17	52.6	44.7	7.1	4.9	NA	2.1	0.3
1992	4,998	2,814	2,383	372	291	NA	118	38	56.3	47.7	7.4	5.8	NA	2.4	0.8
1993	4,925	2,847	2,465	365	264	NA	108	27	57.8	50.1	7.4	5.4	NA	2.2	0.5
Nonprofit institutions															
1981	1,108	482	409	36	64	34	NA	5	43.5	36.9	3.2	5.8	3.1	NA	0.5
1982	1,189	540	437	52	72	51	NA	14	45.4	36.8	4.4	6.1	4.3	NA	1.2
1983	1,170	533	458	50	60	41	NA	7	45.6	39.1	4.3	5.1	3.5	NA	0.6
1984	1,098	516	433	49	68	54	NA	4	47.0	39.4	4.5	6.2	4.9	NA	0.4
1985	1,279	557	445	80	88	53	NA	10	43.5	34.8	6.3	6.9	4.1	NA	0.8
1986	1,092	507	404	66	87	51	NA	9	46.4	37.0	6.0	8.0	4.7	NA	0.8
1987	1,225	602	487	79	92	67	NA	7	49.1	39.8	6.4	7.5	5.5	NA	0.6

(continued)

Appendix table 5-38.

Intersectoral coauthorship of U.S. articles, by selected field groupings: 1981–93

(page 5 of 7)

	All articles	Articles coauthored with													
		All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other
		Number							Percent						
Chemistry, physics, earth and space sciences, and mathematics															
1988	1,432	712	567	89	122	79	NA	12	49.7	39.6	6.2	8.5	5.5	NA	0.8
1989	1,462	760	615	89	110	96	NA	21	52.0	42.1	6.1	7.5	6.6	NA	1.4
1990	1,560	851	701	83	138	100	NA	21	54.6	44.9	5.3	8.8	6.4	NA	1.3
1991	1,705	938	769	110	149	103	NA	24	55.0	45.1	6.5	8.7	6.0	NA	1.4
1992	1,524	881	727	98	139	118	NA	23	57.8	47.7	6.4	9.1	7.7	NA	1.5
1993	1,681	927	749	116	165	108	NA	26	55.1	44.6	6.9	9.8	6.4	NA	1.5
Other sectors															
1981	287	129	81	17	25	8	10	NA	44.9	28.2	5.9	8.7	2.8	3.5	NA
1982	329	141	90	22	28	12	15	NA	42.9	27.4	6.7	8.5	3.6	4.6	NA
1983	359	181	124	40	31	19	9	NA	50.4	34.5	11.1	8.6	5.3	2.5	NA
1984	335	174	115	26	36	14	5	NA	51.9	34.3	7.8	10.7	4.2	1.5	NA
1985	459	220	139	48	30	7	17	NA	47.9	30.3	10.5	6.5	1.5	3.7	NA
1986	435	251	149	52	43	13	12	NA	57.7	34.3	12.0	9.9	3.0	2.8	NA
1987	414	243	145	55	52	13	5	NA	58.7	35.0	13.3	12.6	3.1	1.2	NA
1988	403	209	130	51	36	22	16	NA	51.9	32.3	12.7	8.9	5.5	4.0	NA
1989	446	256	156	64	42	14	27	NA	57.4	35.0	14.3	9.4	3.1	6.1	NA
1990	436	257	163	48	48	22	16	NA	58.9	37.4	11.0	11.0	5.0	3.7	NA
1991	564	326	204	75	50	20	24	NA	57.8	36.2	13.3	8.9	3.5	4.3	NA
1992	520	358	205	94	58	39	17	NA	68.8	39.4	18.1	11.2	7.5	3.3	NA
1993	550	348	214	85	69	28	22	NA	63.3	38.9	15.5	12.5	5.1	4.0	NA
Engineering and technology															
Academic institutions															
1981	6,470	1,298	NA	746	260	259	67	69	20.1	NA	11.5	4.0	4.0	1.0	1.1
1982	6,418	1,284	NA	732	268	233	74	65	20.0	NA	11.4	4.2	3.6	1.2	1.0
1983	6,963	1,412	NA	811	311	275	59	62	20.3	NA	11.6	4.5	3.9	0.8	0.9
1984	6,796	1,348	NA	757	318	244	66	61	19.8	NA	11.1	4.7	3.6	1.0	0.9
1985	6,345	1,167	NA	645	273	256	51	36	18.4	NA	10.2	4.3	4.0	0.8	0.6
1986	6,276	1,149	NA	629	283	250	53	26	18.3	NA	10.0	4.5	4.0	0.8	0.4
1987	6,192	1,147	NA	617	283	241	59	48	18.5	NA	10.0	4.6	3.9	1.0	0.8
1988	6,518	1,262	NA	676	308	270	71	40	19.4	NA	10.4	4.7	4.1	1.1	0.6
1989	6,657	1,207	NA	644	277	278	61	30	18.1	NA	9.7	4.2	4.2	0.9	0.5
1990	7,214	1,436	NA	797	344	279	79	60	19.9	NA	11.0	4.8	3.9	1.1	0.8
1991	7,114	1,429	NA	810	333	282	65	46	20.1	NA	11.4	4.7	4.0	0.9	0.6
1992	7,953	1,676	NA	915	417	378	70	61	21.1	NA	11.5	5.2	4.8	0.9	0.8
1993	7,404	1,513	NA	818	382	297	68	80	20.4	NA	11.0	5.2	4.0	0.9	1.1
Industry															
1981	4,770	988	746	NA	159	89	41	53	20.7	15.6	NA	3.3	1.9	0.9	1.1
1982	4,356	953	732	NA	125	81	47	49	21.9	16.8	NA	2.9	1.9	1.1	1.1
1983	5,075	1,106	811	NA	188	118	39	50	21.8	16.0	NA	3.7	2.3	0.8	1.0
1984	4,483	1,002	757	NA	149	107	46	32	22.4	16.9	NA	3.3	2.4	1.0	0.7
1985	3,612	876	645	NA	123	112	59	32	24.3	17.9	NA	3.4	3.1	1.6	0.9

(continued)

Appendix table 5-38.

Intersectoral coauthorship of U.S. articles, by selected field groupings: 1981–93

(page 6 of 7)

	All articles	Articles coauthored with													
		All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other
		Number							Percent						
Engineering and technology															
1986	3,085	823	629	NA	121	117	26	20	26.7	20.4	NA	3.9	3.8	0.8	0.6
1987	2,635	765	617	NA	121	64	31	16	29.0	23.4	NA	4.6	2.4	1.2	0.6
1988	2,854	851	676	NA	121	77	40	17	29.8	23.7	NA	4.2	2.7	1.4	0.6
1989	2,766	821	644	NA	122	73	35	18	29.7	23.3	NA	4.4	2.6	1.3	0.7
1990	3,015	993	797	NA	147	104	35	24	32.9	26.4	NA	4.9	3.4	1.2	0.8
1991	3,085	995	810	NA	137	80	36	26	32.3	26.3	NA	4.4	2.6	1.2	0.8
1992	3,060	1,167	915	NA	189	110	47	44	38.1	29.9	NA	6.2	3.6	1.5	1.4
1993	2,898	1,063	818	NA	179	89	37	48	36.7	28.2	NA	6.2	3.1	1.3	1.7
Federal Government															
1981	1,254	428	260	159	NA	33	14	21	34.1	20.7	12.7	NA	2.6	1.1	1.7
1982	1,151	393	268	125	NA	20	18	13	34.1	23.3	10.9	NA	1.7	1.6	1.1
1983	1,358	497	311	188	NA	42	14	12	36.6	22.9	13.8	NA	3.1	1.0	0.9
1984	1,264	469	318	149	NA	27	14	7	37.1	25.2	11.8	NA	2.1	1.1	0.6
1985	1,086	412	273	123	NA	39	24	10	37.9	25.1	11.3	NA	3.6	2.2	0.9
1986	1,032	399	283	121	NA	31	9	6	38.7	27.4	11.7	NA	3.0	0.9	0.6
1987	867	392	283	121	NA	27	10	7	45.2	32.6	14.0	NA	3.1	1.2	0.8
1988	906	417	308	121	NA	23	15	10	46.0	34.0	13.4	NA	2.5	1.7	1.1
1989	913	401	277	122	NA	35	10	5	43.9	30.3	13.4	NA	3.8	1.1	0.5
1990	974	470	344	147	NA	38	7	8	48.3	35.3	15.1	NA	3.9	0.7	0.8
1991	996	442	333	137	NA	14	12	6	44.4	33.4	13.8	NA	1.4	1.2	0.6
1992	1,157	584	417	189	NA	44	19	15	50.5	36.0	16.3	NA	3.8	1.6	1.3
1993	1,073	558	382	179	NA	32	29	17	52.0	35.6	16.7	NA	3.0	2.7	1.6
FFRDCs															
1981	1,441	354	259	89	33	NA	6	3	24.6	18.0	6.2	2.3	NA	0.4	0.2
1982	1,183	334	233	81	20	NA	7	2	28.2	19.7	6.8	1.7	NA	0.6	0.2
1983	1,521	444	275	118	42	NA	6	5	29.2	18.1	7.8	2.8	NA	0.4	0.3
1984	1,115	386	244	107	27	NA	13	4	34.6	21.9	9.6	2.4	NA	1.2	0.4
1985	1,408	414	256	112	39	NA	8	4	29.4	18.2	8.0	2.8	NA	0.6	0.3
1986	1,025	397	250	117	31	NA	10	4	38.7	24.4	11.4	3.0	NA	1.0	0.4
1987	1,140	328	241	64	27	NA	7	6	28.8	21.1	5.6	2.4	NA	0.6	0.5
1988	940	370	270	77	23	NA	14	5	39.4	28.7	8.2	2.4	NA	1.5	0.5
1989	967	385	278	73	35	NA	10	3	39.8	28.7	7.5	3.6	NA	1.0	0.3
1990	922	387	279	104	38	NA	15	7	42.0	30.3	11.3	4.1	NA	1.6	0.8
1991	885	390	282	80	14	NA	11	2	44.1	31.9	9.0	1.6	NA	1.2	0.2
1992	1,140	515	378	110	44	NA	13	10	45.2	33.2	9.6	3.9	NA	1.1	0.9
1993	888	409	297	89	32	NA	13	5	46.1	33.4	10.0	3.6	NA	1.5	0.6
Nonprofit institutions															
1981	348	112	67	41	14	6	NA	6	32.2	19.3	11.8	4.0	1.7	NA	1.7
1982	291	122	74	47	18	7	NA	4	41.9	25.4	16.2	6.2	2.4	NA	1.4
1983	332	107	59	39	14	6	NA	5	32.2	17.8	11.7	4.2	1.8	NA	1.5

(continued)

Appendix table 5-38.

Intersectoral coauthorship of U.S. articles, by selected field groupings: 1981–93

(page 7 of 7)

	Articles coauthored with														
	All articles	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other	All sectors	Academia	Industry	Federal	FFRDCs	Nonprofit	Other
	Number								Percent						
Engineering and technology															
1984	330	120	66	46	14	13	NA	3	36.4	20.0	13.9	4.2	3.9	NA	0.9
1985	269	113	51	59	24	8	NA	3	42.0	19.0	21.9	8.9	3.0	NA	1.1
1986	236	84	53	26	9	10	NA	1	35.6	22.5	11.0	3.8	4.2	NA	0.4
1987	208	85	59	31	10	7	NA	0	40.9	28.4	14.9	4.8	3.4	NA	0.0
1988	245	115	71	40	15	14	NA	2	46.9	29.0	16.3	6.1	5.7	NA	0.8
1989	233	99	61	35	10	10	NA	1	42.5	26.2	15.0	4.3	4.3	NA	0.4
1990	234	120	79	35	7	15	NA	6	51.3	33.8	15.0	3.0	6.4	NA	2.6
1991	220	103	65	36	12	11	NA	2	46.8	29.5	16.4	5.5	5.0	NA	0.9
1992	256	125	70	47	19	13	NA	7	48.8	27.3	18.4	7.4	5.1	NA	2.7
1993	238	128	68	37	29	13	NA	6	53.8	28.6	15.5	12.2	5.5	NA	2.5
Other sectors															
1981	301	124	69	53	21	3	6	NA	41.2	22.9	17.6	7.0	1.0	2.0	NA
1982	267	113	65	49	13	2	4	NA	42.3	24.3	18.4	4.9	0.7	1.5	NA
1983	225	117	62	50	12	5	5	NA	52.0	27.6	22.2	5.3	2.2	2.2	NA
1984	202	91	61	32	7	4	3	NA	45.0	30.2	15.8	3.5	2.0	1.5	NA
1985	144	74	36	32	10	4	3	NA	51.4	25.0	22.2	6.9	2.8	2.1	NA
1986	109	48	26	20	6	4	1	NA	44.0	23.9	18.3	5.5	3.7	0.9	NA
1987	103	62	48	16	7	6	0	NA	60.2	46.6	15.5	6.8	5.8	0.0	NA
1988	123	64	40	17	10	5	2	NA	52.0	32.5	13.8	8.1	4.1	1.6	NA
1989	95	48	30	18	5	3	1	NA	50.5	31.6	18.9	5.3	3.2	1.1	NA
1990	148	90	60	24	8	7	6	NA	60.8	40.5	16.2	5.4	4.7	4.1	NA
1991	148	69	46	26	6	2	2	NA	46.6	31.1	17.6	4.1	1.4	1.4	NA
1992	171	103	61	44	15	10	7	NA	60.2	35.7	25.7	8.8	5.8	4.1	NA
1993	213	132	80	48	17	5	6	NA	62.0	37.6	22.5	8.0	2.3	2.8	NA

NA = not applicable; FFRDC = federally funded research and development center

NOTE: In this table, an article is counted in a given sector if at least one author's affiliation is with that sector. Since some articles have authors from more than two sectors, the "all sectors" total is smaller than the sum of the sectors.

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF special tabulations.*Science and Engineering Indicators – 1996*

Appendix table 5-39.

Sectoral distribution of citations in U.S. scientific and technical articles, by field: 1990–93
(page 1 of 3)

Citing sector	U.S. total	Cited sector											
		Academia	Industry	Federal	FFRDC	Nonprofit	Other	Academia	Industry	Federal	FFRDC	Nonprofit	Other
		Number						Percent					
Total science and engineering													
U.S. total	2,174,118	1,532,947	172,763	210,899	41,463	190,501	25,546	70.5	7.9	9.7	1.9	8.8	1.2
Academic	1,595,405	1,221,061	93,882	120,152	23,735	120,675	15,903	76.5	5.9	7.5	1.5	7.6	1.0
Industry	147,441	70,533	52,647	11,525	2,714	8,679	1,345	47.8	35.7	7.8	1.8	5.9	0.9
Federal government . . .	189,889	99,541	12,265	59,046	2,681	13,909	2,450	52.4	6.5	31.1	1.4	7.3	1.3
FFRDCs	36,884	18,970	3,422	2,211	11,100	1,084	98	51.4	9.3	6.0	30.1	2.9	0.3
Non-profit	177,207	106,344	9,056	14,786	1,050	43,151	2,821	60.0	5.1	8.3	0.6	24.4	1.6
Other	27,289	16,501	1,492	3,177	184	3,004	2,933	60.5	5.5	11.6	0.7	11.0	10.7
Clinical medicine													
U.S. total	770,305	525,859	39,293	87,002	1,428	99,409	17,313	68.3	5.1	11.3	0.2	12.9	2.2
Academic	545,396	400,762	20,683	51,101	854	61,158	10,836	73.5	3.8	9.4	0.2	11.2	2.0
Industry	39,088	19,636	10,913	3,837	58	3,900	747	50.2	27.9	9.8	0.1	10.0	1.9
Federal government . . .	73,136	39,112	3,417	21,524	115	7,322	1,651	53.5	4.7	29.4	0.2	10.0	2.3
FFRDCs	1,517	858	56	159	292	135	15	56.6	3.7	10.5	19.2	8.9	1.0
Non-profit	94,347	55,429	3,559	8,361	89	24,669	2,238	58.8	3.8	8.9	0.1	26.1	2.4
Other	16,819	10,062	668	2,022	20	2,223	1,827	59.8	4.0	12.0	0.1	13.2	10.9
Biomedical research													
U.S. total	772,465	561,311	53,083	72,844	5,202	74,887	5,136	72.7	6.9	9.4	0.7	9.7	0.7
Academic	583,764	452,923	31,908	43,021	3,304	49,364	3,242	77.6	5.5	7.4	0.6	8.5	0.6
Industry	43,490	23,473	11,346	4,091	309	3,938	334	54.0	26.1	9.4	0.7	9.1	0.8
Federal government . . .	67,050	36,755	4,573	19,458	422	5,453	389	54.8	6.8	29.0	0.6	8.1	0.6
FFRDCs	4,479	2,818	281	285	806	270	17	62.9	6.3	6.4	18.0	6.0	0.4
Non-profit	67,127	41,233	4,517	5,354	312	15,231	480	61.4	6.7	8.0	0.5	22.7	0.7
Other	6,555	4,112	456	635	51	629	673	62.7	7.0	9.7	0.8	9.6	10.3
Biology													
U.S. total	104,841	82,982	2,968	14,015	195	3,337	1,342	79.2	2.8	13.4	0.2	3.2	1.3
Academic	82,788	70,734	1,874	7,056	134	2,148	844	85.4	2.3	8.5	0.2	2.6	1.0
Industry	2,955	1,828	637	341	5	103	39	61.9	21.6	11.5	0.2	3.5	1.3
Federal government . . .	13,952	7,015	331	6,121	21	266	200	50.3	2.4	43.9	0.2	1.9	1.4
FFRDCs	223	154	3	32	26	7	1	69.1	1.3	14.3	11.7	3.1	0.4
Non-profit	3,330	2,186	81	252	6	757	48	65.6	2.4	7.6	0.2	22.7	1.4
Other	1,592	1,066	43	214	4	54	215	67.0	2.7	13.4	0.3	3.4	13.5

(continued)

Appendix table 5-39.

Sectoral distribution of citations in U.S. scientific and technical articles, by field: 1990–93

(page 2 of 3)

Citing sector	U.S. total	Cited sector											
		Academia	Industry	Federal	FFRDC	Nonprofit	Other	Academia	Industry	Federal	FFRDC		
		Number						Percent					
Chemistry													
U.S. total	146,224	114,847	18,733	6,354	4,004	1,938	348	78.5	12.8	4.3	2.7	1.3	0.2
Academic	116,974	100,316	9,734	3,056	2,603	1,068	199	85.8	8.3	2.6	2.2	0.9	0.2
Industry	17,310	8,390	7,626	737	263	232	64	48.5	44.1	4.3	1.5	1.3	0.4
Federal government . . .	5,877	2,630	735	2,257	100	131	28	44.8	12.5	38.4	1.7	2.2	0.5
FFRDCs	3,165	1,712	306	110	1,007	21	6	54.1	9.7	3.5	31.8	0.7	0.2
Non-profit	2,401	1,509	255	131	25	472	7	62.8	10.6	5.5	1.0	19.7	0.3
Other	497	290	75	62	8	13	48	58.4	15.1	12.5	1.6	2.6	9.7
Physics													
U.S. total	210,254	132,597	43,918	10,622	19,571	3,233	315	63.1	20.9	5.1	9.3	1.5	0.1
Academic	146,871	106,211	22,077	5,363	10,952	2,089	179	72.3	15.0	3.7	7.5	1.4	0.1
Industry	31,777	11,450	17,285	1,205	1,532	248	56	36.0	54.4	3.8	4.8	0.8	0.2
Federal government . . .	10,975	4,833	1,911	3,281	763	150	40	44.0	17.4	29.9	7.0	1.4	0.4
FFRDCs	17,295	8,272	2,186	549	6,058	208	22	47.8	12.6	3.2	35.0	1.2	0.1
Non-profit	2,895	1,607	356	186	215	526	8	55.5	12.3	6.4	7.4	18.2	0.3
Other	438	225	103	39	52	11	11	51.4	23.5	8.9	11.9	2.5	2.5
Earth and space sciences													
U.S. total	113,065	74,739	5,473	16,287	8,795	6,858	911	66.1	4.8	14.4	7.8	6.1	0.8
Academic	77,443	55,872	3,023	8,836	4,825	4,392	495	72.1	3.9	11.4	6.2	5.7	0.6
Industry	4,931	2,438	1,043	875	334	164	78	49.4	21.2	17.7	6.8	3.3	1.6
Federal government . . .	15,107	7,563	792	4,959	1,136	530	128	50.1	5.2	32.8	7.5	3.5	0.8
FFRDCs	8,191	4,332	363	970	2,079	418	29	52.9	4.4	11.8	25.4	5.1	0.4
Non-profit	6,267	3,937	163	461	378	1,296	34	62.8	2.6	7.4	6.0	20.7	0.5
Other	1,123	598	90	185	44	59	148	53.3	8.0	16.5	3.9	5.3	13.2
Engineering and technology													
U.S. total	44,289	29,357	8,670	3,462	2,039	615	145	66.3	19.6	7.8	4.6	1.4	0.3
Academic	30,907	23,959	4,134	1,529	914	282	88	77.5	13.4	4.9	3.0	0.9	0.3
Industry	7,401	2,986	3,671	428	203	88	27	40.3	49.6	5.8	2.7	1.2	0.4
Federal government . . .	3,341	1,341	478	1,349	116	44	13	40.1	14.3	40.4	3.5	1.3	0.4
FFRDCs	1,812	689	217	105	773	24	4	38.0	12.0	5.8	42.7	1.3	0.2
Non-profit	619	271	115	33	24	173	4	43.8	18.6	5.3	3.9	27.9	0.6
Other	207	110	54	18	9	6	9	53.1	26.1	8.7	4.3	2.9	4.3

(continued)

Appendix table 5-39.

Sectoral distribution of citations in U.S. scientific and technical articles, by field: 1990–93

(page 3 of 3)

Citing sector	U.S. total	Cited sector											
		Academia	Industry	Federal	FFRDC	Nonprofit	Other	Academia	Industry	Federal	FFRDC	Nonprofit	Other
		Number						Percent					
Mathematics													
U.S. total	12,676	11,256	624	312	229	224	33	88.8	4.9	2.5	1.8	1.8	0.3
Academic	11,262	10,285	448	186	152	171	21	91.3	4.0	1.7	1.3	1.5	0.2
Industry	487	331	125	14	10	6	1	68.0	25.7	2.9	2.1	1.2	0.2
Federal government ..	449	292	29	102	9	13	3	65.0	6.5	22.7	2.0	2.9	0.7
FFRDCs	203	134	9	1	58	0	1	66.0	4.4	0.5	28.6	0.0	0.5
Non-profit	221	173	11	7	0	29	0	78.3	5.0	3.2	0.0	13.1	0.0
Other	55	39	2	2	0	5	3	70.9	3.6	3.6	0.0	9.1	5.5

NOTE: Includes only citations from U.S. papers to other U.S. papers. References in 1990–93 publications to 3-year article cohorts were aggregated (e.g., 1993 citing 1989–91 articles, 1992 citing 1988–90 articles, etc.)

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF special tabulations.

Science & Engineering Indicators – 1996

Appendix table 5-40.

Citations on U.S. patents to U.S. articles, by performer sector and field: 1987–88 and 1993–94
 (page 1 of 2)

Sector	All fields	Clinical medicine	Biomedical research	Biology	Chemistry	Physics	Earth, space sources	Engineering technology	Mathematics
Number: 1987–88									
Total	15,955	4,014	4,640	260	2,105	2,851	131	1,952	2
Academic institutions	7,966	2,264	2,855	168	1,249	825	53	551	1
Industry	4,418	529	580	31	619	1,509	35	1,114	1
Federal Government	1,485	476	498	54	102	194	24	137	0
FFRDCs	560	38	47	1	71	294	12	97	0
Nonprofit institutions	1,348	624	587	6	60	25	1	45	0
Other	178	83	73	0	4	4	6	8	0
Number: 1993–94									
Total	47,407	12,324	18,333	1,171	5,618	5,529	155	4,248	29
Academic institutions	26,221	7,179	10,888	777	3,597	2,061	73	1,626	20
Industry	11,389	1,863	3,158	154	1,500	2,550	51	2,105	8
Federal Government	4,034	1,340	1,786	183	198	321	11	195	0
FFRDCs	1,224	83	211	4	179	505	7	234	1
Nonprofit institutions	3,991	1,617	2,037	42	136	84	6	69	0
Other	548	242	253	11	8	8	7	19	0
Percent of field: 1987–88									
Total	100.0	25.2	29.1	1.6	13.2	17.9	0.8	12.2	0.0
Academic institutions	100.0	28.4	35.8	2.1	15.7	10.4	0.7	6.9	0.0
Industry	100.0	12.0	13.1	0.7	14.0	34.2	0.8	25.2	0.0
Federal Government	100.0	32.1	33.5	3.6	6.9	13.1	1.6	9.2	0.0
FFRDCs	100.0	6.8	8.4	0.2	12.7	52.5	2.1	17.3	0.0
Nonprofit institutions	100.0	46.3	43.5	0.4	4.5	1.9	0.1	3.3	0.0
Other	100.0	46.6	41.0	0.0	2.2	2.2	3.4	4.5	0.0
Percent of field: 1993–94									
Total	100.0	26.0	38.7	2.5	11.9	11.7	0.3	9.0	0.1
Academic institutions	100.0	27.4	41.5	3.0	13.7	7.9	0.3	6.2	0.1
Industry	100.0	16.4	27.7	1.4	13.2	22.4	0.4	18.5	0.1
Federal Government	100.0	33.2	44.3	4.5	4.9	8.0	0.3	4.8	0.0
FFRDCs	100.0	6.8	17.2	0.3	14.6	41.3	0.6	19.1	0.1
Nonprofit institutions	100.0	40.5	51.0	1.1	3.4	2.1	0.2	1.7	0.0
Other	100.0	44.2	46.2	2.0	1.5	1.5	1.3	3.5	0.0

(continued)

Appendix table 5-40.

Citations on U.S. patents to U.S. articles, by performer sector and field: 1987–88 and 1993–94

(page 2 of 2)

Sector	All fields	Clinical medicine	Biomedical research	Biology	Chemistry	Physics	Earth, space sources	Engineering technology	Mathematics
Percent of sector: 1987–88									
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Academic institutions	49.9	56.4	61.5	64.6	59.3	28.9	40.5	28.2	50.0
Industry	27.7	13.2	12.5	11.9	29.4	52.9	26.7	57.1	50.0
Federal Government	9.3	11.9	10.7	20.8	4.8	6.8	18.3	7.0	0.0
FFRDCs	3.5	0.9	1.0	0.4	3.4	10.3	9.2	5.0	0.0
Nonprofit institutions	8.4	15.5	12.7	2.3	2.9	0.9	0.8	2.3	0.0
Other	1.1	2.1	1.6	0.0	0.2	0.1	4.6	0.4	0.0
Percent of sector: 1993–94									
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Academic institutions	55.3	58.3	59.4	66.4	64.0	37.3	47.1	38.3	69.0
Industry	24.0	15.1	17.2	13.2	26.7	46.1	32.9	49.6	27.6
Federal Government	8.5	10.9	9.7	15.6	3.5	5.8	7.1	4.6	0.0
FFRDCs	2.6	0.7	1.2	0.3	3.2	9.1	4.5	5.5	3.4
Nonprofit institutions	8.4	13.1	11.1	3.6	2.4	1.5	3.9	1.6	0.0
Other	1.2	2.0	1.4	0.9	0.1	0.1	4.5	0.4	0.0

FFRDC = federally funded research and development center

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF special tabulations.

Science and Engineering Indicators – 1996

Appendix table 5-41.

Selected countries' citations to the international scientific and technical literature, by field: 1991–93

(page 1 of 5)

Citing country	US	UK	Ge	Fr	It	NC	WEO	Ja	Ca	USSR	ECE	Is	NE	Af	SCA	ANZ	In	Ch	NIE	APO
Percent to cited country																				
All fields																				
United States (US)	69.5	5.7	3.9	2.8	1.2	1.1	4.1	4.2	3.2	0.4	0.4	0.7	0.1	0.2	0.4	1.5	0.2	0.2	0.1	
United Kingdom (UK)	37.7	32.3	4.4	3.5	1.7	1.7	5.5	4.2	3.2	0.4	0.5	0.6	0.1	0.4	0.4	2.4	0.3	0.1	0.3	
Germany (Ge)	37.5	6.6	29.1	3.9	1.8	1.5	6.7	4.8	2.7	0.9	0.8	0.7	0.1	0.2	0.4	1.5	0.3	0.2	0.2	
France (Fr)	39.5	7.0	5.3	25.2	2.0	1.4	6.3	4.9	3.2	0.6	0.7	0.7	0.2	0.3	0.5	1.5	0.3	0.2	0.1	
Italy (It)	38.2	7.9	5.2	4.4	22.5	1.6	6.7	5.0	3.1	0.7	0.8	0.7	0.1	0.2	0.5	1.5	0.4	0.2	0.3	
Nordic countries (NC)	38.1	9.2	5.0	3.3	1.9	23.2	6.3	4.1	3.7	0.5	0.6	0.6	0.1	0.3	0.4	1.9	0.2	0.2	0.1	
W Europe, other (WEO)	38.8	8.0	6.4	4.4	2.2	1.7	24.8	4.7	3.2	0.6	0.8	0.7	0.2	0.3	0.5	1.7	0.4	0.2	0.3	
Japan (Ja)	36.4	5.1	4.2	3.0	1.3	0.9	4.1	38.7	2.3	0.4	0.4	0.5	0.1	0.1	0.3	1.2	0.3	0.2	0.1	
Canada (Ca)	43.7	7.0	4.0	3.3	1.4	1.5	4.7	4.1	25.2	0.3	0.5	0.6	0.1	0.3	0.4	2.0	0.3	0.2	0.1	
Former USSR (USSR)	28.9	4.7	6.6	3.9	1.8	1.1	4.8	5.8	2.2	34.5	1.7	0.7	0.1	0.2	0.5	1.1	0.6	0.5	0.3	
Eastern/Central Europe (ECE)	31.5	6.2	8.1	4.6	2.5	1.6	7.1	6.2	3.3	2.1	21.7	0.7	0.3	0.3	0.6	1.4	1.0	0.5	0.4	
Israel (Is)	47.6	6.2	4.5	3.5	1.5	1.2	4.9	4.5	3.1	0.8	0.5	18.1	0.2	0.3	0.4	1.6	0.3	0.1	0.1	
Near East (NE)	27.2	8.7	4.3	6.2	2.1	1.1	6.0	3.7	3.3	0.7	1.3	0.7	26.7	1.3	1.0	1.7	2.4	0.5	0.7	
Africa (Af)	31.7	10.3	4.0	3.3	1.4	1.5	5.2	2.8	3.4	0.5	0.6	0.9	0.5	27.0	1.2	3.4	0.9	0.3	0.5	
S/Ctrl America (SCA)	38.6	6.7	4.8	4.5	2.3	1.3	6.0	4.2	3.7	0.7	0.9	0.9	0.2	0.6	20.8	2.0	0.7	0.3	0.4	
Australia, NZ (ANZ)	37.9	10.1	4.0	3.1	1.4	1.6	5.0	3.8	3.8	0.4	0.4	0.6	0.1	0.5	0.5	25.8	0.3	0.2	0.3	
India (In)	32.2	5.8	4.9	3.4	2.0	0.8	4.9	6.2	2.9	0.9	1.3	0.8	0.5	0.5	1.0	1.6	28.6	0.7	0.8	
China (Ch)	37.0	5.2	5.9	4.6	2.2	1.1	5.8	8.8	3.2	1.1	1.2	0.8	0.2	0.2	0.8	1.4	1.4	17.9	0.9	
East Asian NIEs (NIE)	42.8	6.5	4.0	3.1	1.8	1.1	4.5	9.1	3.2	0.4	0.7	0.7	0.2	0.3	0.6	1.6	0.9	0.8	17.4	
Asia/Pacific, other (APO) . . .	32.1	9.6	3.9	2.9	1.3	1.2	5.3	5.9	2.6	0.8	1.1	0.5	0.7	1.9	1.7	4.9	2.5	0.9	1.2	19.1
Clinical medicine																				
United States (US)	69.4	6.6	2.7	2.5	1.6	1.6	4.5	3.6	3.4	0.1	0.3	0.6	0.1	0.3	0.4	1.7	0.1	0.1	0.2	
United Kingdom (UK)	35.9	35.1	3.2	3.0	2.1	2.5	6.0	3.4	3.2	0.1	0.3	0.6	0.2	0.5	0.4	2.8	0.2	0.1	0.3	
Germany (Ge)	40.0	8.9	23.2	3.3	2.4	2.4	8.1	4.3	2.9	0.1	0.4	0.6	0.1	0.3	0.3	2.0	0.1	0.1	0.3	
France (Fr)	41.7	9.2	3.7	21.1	2.4	2.1	7.3	4.3	3.5	0.1	0.4	0.6	0.1	0.4	0.5	2.0	0.1	0.1	0.1	
Italy (It)	39.6	10.1	3.9	3.9	20.7	2.4	7.1	4.4	3.3	0.1	0.5	0.7	0.1	0.2	0.5	1.8	0.2	0.1	0.4	
Nordic countries (NC)	36.8	11.1	3.8	2.7	2.3	25.2	6.8	3.5	3.2	0.1	0.4	0.6	0.1	0.4	0.3	2.1	0.2	0.1	0.3	
W Europe, other (WEO)	40.6	10.2	5.0	3.9	2.6	2.5	22.8	4.2	3.3	0.1	0.4	0.6	0.2	0.4	0.4	2.1	0.2	0.1	0.3	
Japan (Ja)	36.9	6.9	3.2	2.6	1.9	1.5	4.9	35.6	2.7	0.1	0.3	0.5	0.1	0.2	0.3	1.7	0.1	0.2	0.3	
Canada (Ca)	46.1	8.6	3.0	3.2	1.8	2.0	5.1	3.9	21.7	0.1	0.3	0.6	0.1	0.3	0.4	2.3	0.1	0.1	0.1	
Former USSR (USSR)	33.8	7.1	5.2	3.6	3.0	2.3	5.7	6.2	2.7	24.6	1.0	0.7	0.2	0.3	0.5	2.1	0.2	0.2	0.3	
Eastern/Central Europe (ECE)	38.0	9.3	6.3	4.1	2.9	2.7	7.7	6.0	3.6	0.4	14.5	0.8	0.1	0.2	0.5	2.0	0.3	0.1	0.3	
Israel (Is)	47.0	8.3	3.0	3.0	2.1	2.2	5.7	3.9	3.6	0.1	0.3	16.4	0.3	0.5	0.6	2.2	0.2	0.1	0.3	
Near East (NE)	36.7	11.9	3.4	5.2	2.9	1.8	6.6	4.0	3.3	0.1	0.7	0.9	14.5	2.3	1.0	1.9	1.3	0.3	1.0	
Africa (Af)	33.3	13.0	2.7	3.1	1.3	2.3	6.0	2.3	2.4	0.1	0.2	0.7	0.7	25.1	1.1	3.0	0.8	0.2	0.6	
S/Ctrl America (SCA)	41.5	8.9	3.3	4.4	2.5	2.0	6.0	4.1	3.5	0.2	0.4	0.9	0.3	0.7	17.8	2.1	0.6	0.2	0.4	
Australia, NZ (ANZ)	39.2	13.0	3.2	2.9	2.0	2.4	5.9	3.4	3.6	0.1	0.3	0.6	0.1	0.4	0.4	21.9	0.1	0.1	0.3	
India (In)	35.6	9.2	2.8	2.5	2.8	1.3	4.7	5.9	2.8	0.3	0.6	0.8	0.9	1.2	1.2	1.9	23.4	0.6	0.8	
China (Ch)	42.1	8.8	4.2	3.4	2.6	2.6	6.4	9.6	3.0	0.1	0.5	0.8	0.2	0.6	0.6	2.3	0.5	10.4	1.0	
East Asian NIEs (NIE)	40.7	10.7	3.3	2.8	2.5	2.1	5.9	7.9	3.2	0.1	0.3	0.7	0.3	0.5	0.5	2.4	0.5	0.7	14.4	
Asia/Pacific, other (APO) . . .	32.7	13.0	2.1	2.7	1.1	1.7	5.5	5.5	1.4	0.1	0.3	0.8	0.4	3.3	2.2	3.9	1.9	0.6	1.6	19.3

(continued)

Appendix table 5-41.

Selected countries' citations to the international scientific and technical literature, by field: 1991-93

(page 2 of 5)

Citing country	US	UK	Ge	Fr	It	NC	WEO	Ja	Ca	USSR	ECE	Is	NE	Af	SCA	ANZ	In	Ch	NIE	APO
Percent to cited country																				
Biomedical research																				
United States (US)	71.3	5.8	4.1	2.9	0.9	0.9	3.8	4.4	2.7	0.4	0.3	0.6	0.0	0.1	0.3	1.2	0.1	0.1	0.1	0.0
United Kingdom (UK)	45.4	26.9	4.8	3.6	1.1	1.2	4.9	5.0	2.9	0.4	0.3	0.7	0.1	0.2	0.3	1.8	0.2	0.1	0.2	0.1
Germany (Ge)	44.8	7.0	24.5	3.9	1.1	1.3	6.0	4.8	2.7	0.6	0.5	0.7	0.0	0.1	0.3	1.2	0.2	0.1	0.1	0.0
France (Fr)	45.7	7.0	5.3	22.2	1.3	1.1	5.6	4.9	3.1	0.5	0.4	0.7	0.1	0.2	0.4	1.3	0.2	0.1	0.2	0.0
Italy (It)	47.0	7.8	5.2	4.0	16.8	1.2	5.4	5.3	2.9	0.5	0.6	0.7	0.1	0.2	0.4	1.4	0.3	0.1	0.2	0.0
Nordic countries (NC)	44.6	7.6	5.3	3.4	1.3	19.1	5.8	5.0	3.5	0.5	0.5	0.7	0.1	0.2	0.3	1.6	0.1	0.1	0.2	0.1
W Europe, other (WEO) . . .	45.5	7.7	6.5	4.2	1.4	1.3	21.6	4.7	3.1	0.5	0.5	0.6	0.0	0.2	0.4	1.5	0.2	0.1	0.2	0.0
Japan (Ja)	45.3	5.8	4.2	3.0	0.9	0.9	3.8	30.5	2.5	0.3	0.3	0.6	0.0	0.1	0.2	1.2	0.1	0.1	0.2	0.1
Canada (Ca)	49.8	6.9	4.4	3.7	1.1	1.3	4.5	4.7	20.0	0.3	0.4	0.7	0.0	0.2	0.3	1.5	0.2	0.1	0.1	0.0
Former USSR (USSR)	34.7	5.8	5.7	3.6	1.1	1.0	4.3	4.6	2.4	32.5	1.1	0.7	0.1	0.1	0.4	1.2	0.3	0.1	0.2	0.0
Eastern/Central Europe (ECE) .	40.8	7.1	7.1	4.5	1.9	1.7	6.8	5.5	4.0	1.6	15.3	0.6	0.1	0.2	0.4	1.4	0.5	0.2	0.3	0.0
Israel (Is)	53.4	6.2	4.8	3.5	1.0	0.9	4.2	5.5	2.8	0.6	0.3	14.5	0.1	0.2	0.2	1.1	0.2	0.1	0.2	0.0
Near East (NE)	33.2	11.7	4.5	9.0	1.6	1.0	6.5	4.4	3.8	1.0	1.1	1.1	13.9	1.1	1.3	2.5	1.1	0.2	0.4	0.5
Africa (Af)	39.0	11.0	4.5	3.9	1.1	1.2	5.1	3.7	3.7	0.5	0.7	0.7	0.2	19.5	1.1	2.9	0.4	0.1	0.3	0.3
S/Ctrl America (SCA)	41.3	7.3	4.6	4.3	1.7	1.3	5.8	4.2	3.2	0.4	0.7	0.9	0.1	0.4	21.0	1.8	0.4	0.1	0.2	0.2
Australia, NZ (ANZ)	45.2	8.9	4.7	3.5	1.1	1.3	5.0	4.7	3.2	0.4	0.4	0.5	0.0	0.3	0.4	19.7	0.1	0.1	0.2	0.1
India (In)	41.4	7.0	4.3	3.2	1.5	0.9	5.0	4.9	3.0	0.6	1.0	1.0	0.1	0.2	1.2	1.6	22.1	0.2	0.5	0.3
China (Ch)	47.6	8.4	5.2	4.3	1.4	1.1	4.4	7.0	2.9	1.1	0.6	0.7	0.2	0.2	0.7	1.8	0.4	10.9	1.0	0.2
East Asian NIEs (NIE)	51.3	7.0	4.2	3.3	1.2	1.2	4.3	8.4	3.4	0.5	0.3	0.7	0.1	0.3	0.4	1.6	0.3	0.3	11.0	0.3
Asia/Pacific, other (APO) . . .	41.2	9.5	2.8	3.0	0.9	1.1	4.8	6.3	2.7	0.6	0.2	0.3	0.5	1.5	1.5	5.1	1.7	0.5	0.6	15.2
Biology																				
United States (US)	71.9	4.5	2.3	1.4	0.4	1.0	2.9	2.4	6.1	0.1	0.3	0.8	0.2	0.6	0.8	3.3	0.3	0.1	0.2	0.2
United Kingdom (UK)	26.6	41.3	3.8	2.5	0.7	2.2	5.4	2.7	5.6	0.1	0.5	0.6	0.2	1.1	0.8	4.7	0.4	0.1	0.2	0.3
Germany (Ge)	26.5	7.7	36.7	2.5	0.8	1.6	6.2	4.6	5.1	0.3	0.9	0.7	0.2	0.9	0.6	3.5	0.6	0.1	0.2	0.2
France (Fr)	30.3	7.8	4.9	28.2	1.4	1.6	6.2	3.9	6.6	0.2	0.6	1.1	0.4	1.0	0.9	4.0	0.4	0.2	0.2	0.3
Italy (It)	31.0	6.3	5.5	4.0	25.2	0.9	6.9	5.0	5.1	0.2	0.9	1.4	0.3	0.8	1.1	3.3	1.1	0.2	0.3	0.4
Nordic countries (NC)	26.6	10.3	4.4	2.4	0.6	31.2	5.4	2.8	9.4	0.4	0.8	0.5	0.2	0.4	0.6	3.2	0.4	0.1	0.2	0.2
W Europe, Other (WEO) . . .	30.0	8.7	6.0	3.6	1.3	2.0	30.4	3.5	5.6	0.3	0.8	1.1	0.3	0.8	1.0	3.6	0.6	0.1	0.2	0.3
Japan (Ja)	23.4	4.0	3.5	2.0	0.6	0.9	2.8	52.9	2.9	0.1	0.4	0.7	0.1	0.4	0.8	2.5	0.6	0.4	0.5	0.6
Canada (Ca)	33.7	6.3	2.3	1.8	0.4	2.0	3.7	2.0	41.6	0.1	0.4	0.5	0.2	0.5	0.5	3.3	0.3	0.1	0.2	0.2
Former USSR (USSR)	25.7	8.0	7.2	2.8	1.0	2.3	4.6	8.2	5.5	24.3	2.1	1.5	0.2	0.5	0.8	3.3	0.9	0.3	0.5	0.4
Eastern/Central Europe (ECE) .	28.4	5.8	8.7	4.3	1.5	2.6	7.1	5.8	6.4	0.9	20.6	1.1	0.4	0.4	1.2	3.5	0.6	0.2	0.3	0.1
Israel (Is)	37.4	5.1	3.3	1.9	0.6	0.6	4.1	3.2	4.6	0.2	0.4	31.8	0.5	1.0	0.7	3.5	0.5	0.1	0.3	0.2
Near East (NE)	28.6	6.0	4.1	3.9	2.4	0.9	5.6	3.2	4.9	0.5	0.5	1.3	26.5	2.1	1.1	3.7	3.4	0.2	0.2	0.7
Africa (Af)	26.3	8.5	3.3	2.3	0.7	1.1	4.4	1.7	4.3	0.2	0.4	1.7	0.4	35.3	1.6	5.8	1.3	0.1	0.2	0.6
S/Ctrl America (SCA)	38.4	5.9	3.0	2.2	1.2	1.0	4.1	2.8	5.4	0.3	0.6	0.9	0.4	1.9	24.6	5.2	1.0	0.1	0.3	0.6
Australia, NZ (ANZ)	26.4	7.3	2.4	1.6	0.4	0.9	3.1	2.2	5.3	0.1	0.2	0.7	0.2	1.1	0.9	45.9	0.5	0.2	0.2	0.5
India (In)	25.6	5.9	4.5	2.5	1.3	0.5	5.4	6.4	4.0	0.2	1.0	1.0	0.8	2.1	1.6	3.2	30.3	0.5	1.3	2.0
China (Ch)	33.3	5.8	4.7	2.4	1.4	1.1	5.1	9.3	7.8	0.1	0.4	0.6	0.4	0.3	1.1	5.2	2.7	16.5	0.6	1.1
East Asian NIEs (NIE)	32.7	4.4	1.8	1.8	1.1	0.9	3.7	12.9	3.3	0.0	0.7	0.9	0.3	0.8	0.7	3.0	1.9	0.8	26.2	2.2
Asia/Pacific, other (APO) . . .	31.2	5.9	3.4	1.6	0.7	1.0	5.2	5.6	3.2	0.2	0.7	0.2	1.1	2.0	2.3	7.4	3.4	0.5	1.3	22.9

(continued)

Appendix table 5-41.

Selected countries' citations to the international scientific and technical literature, by field: 1991–93

(page 3 of 5)

Citing country	US	UK	Ge	Fr	It	NC	WEO	Ja	Ca	USSR	ECE	Is	NE	Af	SCA	ANZ	In	Ch	NIE	APO
Percent to cited country																				
Chemistry																				
United States (US)	63.2	4.9	5.7	3.3	1.7	0.5	4.6	6.7	3.1	0.6	1.2	0.6	0.2	0.2	0.3	1.3	0.8	0.4	0.6	0.0
United Kingdom (UK)	26.9	36.4	6.3	4.4	2.2	0.7	5.9	6.4	2.9	0.9	1.3	0.5	0.3	0.3	0.4	1.9	1.1	0.4	0.6	0.1
Germany (Ge)	24.1	4.8	44.7	3.9	1.7	0.7	5.6	5.6	2.4	1.1	1.6	0.5	0.2	0.2	0.3	1.3	0.5	0.4	0.3	0.0
France (Fr)	26.3	5.1	6.3	36.5	2.6	0.7	6.2	7.0	2.8	0.8	1.3	0.4	0.4	0.3	0.5	1.0	0.8	0.4	0.7	0.1
Italy (It)	24.6	5.5	5.5	5.0	35.9	0.6	6.2	7.3	2.7	0.7	1.6	0.5	0.2	0.2	0.5	1.3	1.0	0.4	0.4	0.1
Nordic countries (NC)	29.1	6.6	7.6	4.5	1.8	26.1	6.8	5.8	3.3	0.9	2.5	0.7	0.2	0.3	0.6	1.4	0.7	0.4	0.4	0.1
W Europe, other (WEO)	26.4	5.6	7.1	4.8	3.0	0.8	34.9	6.6	3.0	0.7	1.9	0.5	0.4	0.3	0.7	1.4	0.9	0.5	0.5	0.0
Japan (Ja)	24.5	3.3	4.3	3.2	1.6	0.4	3.6	52.6	2.0	0.4	0.8	0.4	0.1	0.2	0.2	0.7	0.6	0.4	0.5	0.1
Canada (Ca)	32.7	6.0	6.0	3.7	2.1	0.7	5.1	5.8	31.0	0.6	1.3	0.5	0.2	0.2	0.6	1.7	0.8	0.4	0.5	0.1
Former USSR (USSR)	18.5	4.3	6.5	3.7	1.6	0.8	4.1	6.8	1.9	44.7	2.7	0.5	0.3	0.2	0.4	1.0	1.0	0.6	0.4	0.1
Eastern/Central Europe (ECE)	21.6	4.6	6.9	4.3	2.8	0.9	6.6	7.8	2.7	2.2	33.1	0.5	0.6	0.3	0.6	1.1	2.0	0.6	0.7	0.1
Israel (Is)	38.5	4.9	7.1	4.0	1.9	0.6	4.7	5.9	2.6	1.0	1.4	23.9	0.2	0.1	0.2	1.3	1.0	0.1	0.4	0.0
Near East (NE)	12.3	5.3	3.6	6.3	1.6	0.5	5.9	3.1	2.2	0.8	1.9	0.3	49.1	0.6	0.7	1.0	3.4	0.4	0.6	0.3
Africa (Af)	20.1	6.6	8.8	3.5	3.3	0.4	4.9	5.0	2.5	0.9	1.5	0.3	0.5	36.1	0.6	2.0	1.4	0.6	0.7	0.2
S/Ctrl America (SCA)	24.7	5.2	5.4	5.1	2.9	0.6	8.8	6.2	4.6	1.1	2.2	0.5	0.4	0.3	27.2	1.7	1.5	0.6	0.8	0.1
Australia, NZ (ANZ)	28.7	7.4	6.9	3.9	2.2	1.1	5.5	5.3	3.4	0.7	1.0	0.5	0.2	0.4	0.5	30.3	0.8	0.3	0.8	0.2
India (In)	23.1	4.7	4.2	3.6	2.2	0.5	4.7	6.8	2.4	0.8	1.6	0.4	0.6	0.3	0.5	1.5	40.2	0.6	0.9	0.3
China (Ch)	26.6	4.8	4.7	4.1	2.6	0.5	6.0	11.2	3.0	0.8	1.9	0.3	0.3	0.3	0.6	1.3	2.2	27.6	0.8	0.1
East Asian NIEs (NIE)	34.3	5.3	4.2	3.2	2.5	0.5	4.2	9.5	3.5	0.5	1.1	0.4	0.3	0.2	0.4	1.5	1.2	0.8	26.4	0.1
Asia/Pacific, other (APO)	19.3	7.6	5.4	2.6	2.3	0.3	7.3	5.9	3.7	0.8	2.6	0.6	1.0	1.0	0.8	5.4	4.1	0.4	1.4	27.6
Physics																				
United States (US)	65.3	3.8	6.6	4.0	1.5	0.8	4.8	5.5	2.3	1.5	0.7	1.0	0.0	0.1	0.4	0.7	0.4	0.4	0.3	0.0
United Kingdom (UK)	35.2	27.8	7.5	5.0	2.1	1.1	6.1	5.8	2.6	1.8	1.1	0.8	0.1	0.1	0.5	1.3	0.6	0.4	0.2	0.1
Germany (Ge)	33.9	4.0	32.5	5.1	2.0	1.1	7.1	5.1	2.0	2.4	1.3	1.0	0.0	0.1	0.5	0.7	0.5	0.5	0.2	0.0
France (Fr)	33.1	4.1	8.3	29.8	2.3	1.0	6.8	5.8	2.0	2.0	1.3	0.9	0.1	0.1	0.6	0.6	0.5	0.5	0.3	0.0
Italy (It)	33.0	5.0	8.5	6.0	23.3	1.3	8.4	4.5	2.4	2.6	1.3	0.7	0.1	0.1	0.7	0.6	0.6	0.5	0.3	0.0
Nordic countries (NC)	36.3	4.9	9.5	6.3	2.9	18.1	5.9	5.6	2.6	3.1	1.4	0.8	0.0	0.0	0.6	0.8	0.5	0.3	0.2	0.0
W Europe, other (WEO)	34.6	4.9	9.6	6.0	2.8	1.1	25.7	5.2	2.4	2.2	1.6	0.9	0.1	0.1	0.7	0.7	0.6	0.5	0.3	0.0
Japan (Ja)	32.7	2.9	5.7	3.7	1.1	0.6	4.2	43.0	1.7	1.2	0.7	0.5	0.0	0.0	0.3	0.4	0.4	0.4	0.3	0.0
Canada (Ca)	40.0	4.6	6.8	4.6	1.6	1.0	5.4	5.2	24.0	1.4	1.1	0.8	0.1	0.1	0.7	0.9	0.7	0.6	0.3	0.0
Former USSR (USSR)	28.7	3.4	7.7	4.3	2.1	0.8	5.4	5.8	1.8	34.6	1.8	0.9	0.1	0.1	0.5	0.5	0.7	0.6	0.2	0.0
Eastern/Central Europe (ECE)	29.7	4.8	11.4	5.4	2.5	1.3	7.5	5.8	2.6	3.8	20.2	0.8	0.2	0.2	0.8	1.0	1.0	0.7	0.3	0.1
Israel (Is)	46.0	3.8	7.1	5.0	1.5	0.6	5.1	4.1	2.1	2.9	0.9	18.4	0.0	0.1	0.4	0.8	0.7	0.2	0.2	0.0
Near East (NE)	24.2	7.5	8.9	8.5	2.2	0.7	5.2	4.4	3.4	2.6	2.8	0.5	21.2	0.2	1.0	0.3	3.5	1.3	0.9	0.7
Africa (Af)	28.2	6.5	7.3	4.2	2.8	1.0	6.4	3.9	3.1	3.0	1.9	0.7	0.1	23.6	2.3	2.1	1.3	0.7	0.7	0.1
S/Ctrl America (SCA)	36.1	4.1	7.9	5.7	3.0	1.1	6.1	5.0	2.4	1.9	1.3	1.2	0.1	0.3	20.9	0.8	0.9	0.8	0.3	0.1
Australia, NZ (ANZ)	34.9	7.4	7.6	4.4	1.5	0.9	5.0	5.3	2.8	2.1	1.1	0.7	0.2	0.2	0.6	23.4	0.9	0.6	0.3	0.0
India (In)	34.2	4.3	7.3	4.3	2.1	0.8	5.5	7.1	2.5	1.6	1.7	1.0	0.2	0.2	1.1	1.1	23.0	1.0	0.7	0.1
China (Ch)	37.8	4.1	7.0	5.2	2.2	1.1	6.0	8.6	3.0	1.5	1.3	0.9	0.1	0.1	1.0	0.8	1.6	16.9	0.6	0.2
East Asian NIEs (NIE)	46.1	3.8	5.7	4.1	1.5	0.6	4.5	10.7	2.7	0.9	1.0	0.9	0.2	0.2	1.1	0.7	1.1	1.1	12.9	0.1
Asia/Pacific, other (APO)	27.6	8.2	8.4	4.6	2.4	0.7	4.4	7.2	2.4	3.6	3.6	0.7	1.0	0.2	0.7	2.9	2.9	2.8	1.3	14.6

(continued)

Appendix table 5-41.

Selected countries' citations to the international scientific and technical literature, by field: 1991-93

(page 4 of 5)

Citing country	US	UK	Ge	Fr	It	NC	WEO	Ja	Ca	USSR	ECE	Is	NE	Af	SCA	ANZ	In	Ch	NIE	APO
Percent to cited country																				
Earth and space sciences																				
United States (US)	72.3	5.2	3.3	3.0	1.1	0.8	2.7	2.1	4.4	0.5	0.3	0.5	0.1	0.4	0.7	2.2	0.3	0.2	0.1	0.1
United Kingdom (UK)	40.4	29.9	4.3	3.9	1.5	1.5	4.6	1.9	4.5	0.5	0.5	0.6	0.1	0.7	0.8	3.4	0.5	0.2	0.1	0.1
Germany (Ge)	44.5	6.7	22.7	4.4	2.0	1.4	5.0	2.4	3.9	0.8	0.6	0.6	0.1	0.6	1.0	2.5	0.4	0.3	0.1	0.1
France (Fr)	42.8	6.5	4.2	26.1	1.4	0.8	5.0	2.2	4.2	0.9	0.6	0.5	0.2	0.6	0.9	2.2	0.3	0.4	0.1	0.1
Italy (It)	42.9	8.7	4.5	4.2	19.8	1.1	5.6	2.3	4.1	0.6	0.7	0.8	0.0	0.4	1.3	2.1	0.3	0.3	0.2	0.0
Nordic countries (NC)	39.4	8.6	5.4	3.3	1.1	22.5	5.0	2.1	6.5	1.3	0.6	0.3	0.1	0.4	0.5	2.2	0.5	0.2	0.1	0.0
W Europe, other (WEO)	38.4	8.7	6.5	4.9	2.5	1.6	23.4	2.2	4.7	0.6	0.7	0.6	0.2	0.7	0.9	2.4	0.5	0.3	0.1	0.1
Japan (Ja)	42.7	6.2	4.2	3.6	1.3	1.1	3.4	28.1	3.5	0.8	0.3	0.3	0.1	0.5	0.6	2.4	0.5	0.3	0.2	0.1
Canada (Ca)	39.9	5.8	3.2	3.2	1.1	1.4	3.3	1.4	34.1	0.4	0.3	0.4	0.2	0.6	0.7	3.2	0.4	0.1	0.1	0.1
Former USSR (USSR)	36.4	5.3	4.6	3.6	1.2	1.6	3.4	2.9	2.9	32.5	1.0	0.3	0.1	0.4	0.7	2.3	0.5	0.2	0.1	0.0
Eastern/Central Europe (ECE)	37.3	6.4	7.5	5.0	2.4	1.8	7.4	3.5	6.3	2.5	13.8	0.7	0.3	1.1	0.8	2.0	0.5	0.5	0.2	0.0
Israel (Is)	46.9	4.7	3.9	3.3	1.2	0.7	4.0	1.4	4.5	0.7	0.4	23.5	0.5	0.4	0.5	2.5	0.5	0.3	0.1	0.0
Near East, other (NEO)	34.0	7.1	5.4	6.9	1.3	1.5	5.6	1.7	3.9	0.4	0.9	1.5	21.2	1.3	1.5	3.2	1.7	0.0	0.0	0.6
Africa (Af)	31.0	7.3	3.1	3.9	1.0	1.3	3.8	2.2	5.9	0.2	0.4	0.4	0.3	31.5	1.1	5.0	0.7	0.2	0.4	0.2
S/Ctrl America (SCA)	45.9	6.1	4.7	4.7	2.9	0.7	4.9	1.9	5.7	0.5	0.8	0.6	0.1	1.0	16.0	2.7	0.8	0.1	0.0	0.1
Australia, NZ (ANZ)	36.8	8.6	3.2	3.3	1.0	0.9	2.4	2.4	5.6	0.4	0.2	0.4	0.1	1.3	0.8	31.5	0.4	0.3	0.1	0.2
India (In)	39.2	7.8	4.4	3.3	1.7	0.9	3.5	2.6	4.0	0.8	0.5	0.9	0.3	1.1	0.9	2.3	25.1	0.2	0.2	0.2
China (Ch)	43.3	5.9	5.8	5.9	2.0	0.5	4.6	4.1	4.4	1.1	0.9	0.7	0.1	0.5	1.1	4.0	0.6	14.0	0.7	0.1
East Asian NIEs (NIE)	52.0	4.4	3.3	2.9	1.1	1.4	3.4	5.8	5.8	0.3	0.8	0.7	0.4	1.7	0.7	3.0	1.7	0.4	9.8	0.4
Asia/Pacific, other (APO)	38.9	6.2	7.1	5.2	0.5	1.9	5.7	3.8	6.6	0.9	0.5	0.5	0.0	0.9	0.9	6.6	1.4	0.9	0.9	10.4
Engineering and technology																				
United States (US)	74.7	3.8	2.7	2.0	0.9	0.6	2.6	5.0	2.2	0.3	0.5	0.6	0.2	0.1	0.3	1.1	0.6	0.6	1.1	0.0
United Kingdom (UK)	31.2	42.9	3.8	3.0	1.4	0.9	3.6	4.4	2.2	0.6	0.7	0.4	0.4	0.1	0.4	1.4	0.6	0.8	1.0	0.1
Germany (Ge)	26.6	4.3	42.9	3.7	1.3	0.9	4.9	6.7	2.2	0.7	1.4	0.4	0.3	0.2	0.3	0.9	0.8	0.9	0.7	0.0
France (Fr)	32.1	5.1	5.2	34.2	1.9	0.8	4.9	6.6	2.5	0.6	1.0	0.5	0.3	0.2	0.6	1.1	0.8	0.8	0.8	0.1
Italy (It)	32.6	5.6	4.9	4.1	30.2	0.7	6.2	5.1	2.9	0.6	1.2	0.5	0.5	0.1	0.3	1.6	0.7	0.6	1.4	0.0
Nordic countries (NC)	36.6	6.2	5.7	3.0	1.4	24.7	5.1	5.3	5.2	0.7	1.0	1.0	0.2	0.0	0.3	1.9	0.4	0.6	0.6	0.0
W Europe, other (WEO)	33.1	6.3	5.5	4.1	1.4	1.1	31.2	5.5	3.0	0.6	1.1	0.9	0.4	0.2	0.7	1.3	1.3	1.1	1.1	0.1
Japan (Ja)	25.2	3.7	4.2	2.2	0.8	0.3	2.4	55.3	1.6	0.5	0.4	0.3	0.1	0.1	0.3	0.7	0.5	0.5	0.9	0.0
Canada (Ca)	34.0	5.4	4.2	2.4	0.9	1.1	3.6	6.1	34.2	0.3	0.8	0.5	0.4	0.4	0.6	1.5	1.1	0.9	1.5	0.1
Former USSR (USSR)	26.5	4.9	8.2	3.9	1.6	0.9	5.6	9.3	2.1	29.8	1.7	0.6	0.3	0.1	0.5	0.7	1.4	1.0	1.0	0.0
Eastern/Central Europe (ECE)	28.3	5.4	8.6	3.8	1.4	0.7	6.1	7.0	2.7	1.8	25.9	0.8	0.5	0.5	0.6	1.3	2.2	1.1	1.2	0.0
Israel (Is)	44.2	3.9	2.2	2.0	0.7	0.8	4.0	4.3	2.8	0.3	0.4	30.0	0.8	0.0	0.3	1.0	0.3	0.5	1.5	0.0
Near East, other (NEO)	27.5	6.9	2.9	3.4	0.6	0.4	4.9	4.2	4.2	0.3	1.1	0.0	34.5	0.5	1.0	1.4	3.8	1.1	1.3	0.0
Africa (Af)	34.9	8.7	3.6	2.5	1.0	0.3	2.3	3.1	5.9	0.8	1.5	2.0	1.0	25.4	0.5	1.3	1.5	0.8	3.1	0.0
S/Ctrl America (SCA)	32.2	4.8	5.7	5.5	1.9	0.9	6.2	4.4	4.8	0.3	0.4	0.4	0.1	0.5	26.8	1.8	0.9	1.0	1.7	0.0
Australia, NZ (ANZ)	36.4	7.6	3.6	2.6	1.3	0.9	3.7	5.1	4.0	0.3	0.4	0.5	0.6	0.7	0.7	28.4	0.7	0.7	1.8	0.1
India (In)	27.9	4.8	3.9	2.5	1.1	0.6	3.3	6.6	4.0	0.5	1.0	0.3	1.2	0.2	0.7	1.6	36.0	1.3	2.2	0.3
China (Ch)	35.5	4.2	6.1	3.8	1.5	0.6	5.3	8.7	3.0	0.3	1.0	0.7	0.2	0.2	0.3	1.6	1.2	22.8	3.0	0.1
East Asian NIEs (NIE)	43.0	4.2	2.3	1.6	0.9	0.5	2.2	8.8	3.1	0.1	0.5	0.6	0.2	0.2	0.9	1.6	1.4	1.1	26.7	0.1
Asia/Pacific, other (APO)	27.7	11.3	3.5	5.0	0.7	0.0	3.5	6.4	4.3	1.4	2.8	0.7	2.1	0.0	2.1	5.0	5.7	1.4	2.1	14.2

(continued)

Appendix table 5-41.

Selected countries' citations to the international scientific and technical literature, by field: 1991–93
 (page 5 of 5)

Citing country	US	UK	Ge	Fr	It	NC	WEO	Ja	Ca	USSR	ECE	Is	NE	Af	SCA	ANZ	In	Ch	NIE	APO
Percent to cited country																				
Mathematics																				
United States (US)	70.1	5.0	3.2	3.5	1.2	1.2	3.2	2.0	3.4	0.4	1.1	1.2	0.1	0.3	0.8	1.8	0.4	0.5	0.5	0.1
United Kingdom (UK)	33.0	39.7	3.9	3.3	1.6	1.2	3.4	1.6	3.7	0.6	0.8	1.5	0.2	0.5	0.8	3.1	0.4	0.3	0.4	0.3
Germany (Ge)	32.4	6.1	32.2	5.0	1.7	1.1	7.3	2.6	3.0	0.7	1.8	1.3	0.2	0.2	0.9	1.4	0.5	0.7	0.6	0.3
France (Fr)	35.0	4.4	4.3	35.9	2.4	1.0	4.4	1.9	3.4	0.8	1.7	1.0	0.5	0.8	0.7	1.0	0.1	0.4	0.3	0.1
Italy (It)	29.0	3.2	2.9	7.2	36.1	0.5	5.3	2.9	1.9	0.6	2.7	1.2	0.3	1.1	1.6	1.4	0.5	0.7	0.6	0.4
Nordic countries (NC)	37.1	8.2	4.5	3.1	2.3	28.9	5.2	2.1	2.3	0.2	1.2	0.9	0.0	0.0	0.9	1.9	0.5	0.0	0.5	0.2
W Europe, other (WEO)	33.1	5.8	5.6	4.8	1.9	0.9	33.7	1.9	3.5	0.6	2.4	0.9	0.3	0.2	1.4	1.4	0.5	0.5	0.4	0.1
Japan (Ja)	34.1	3.3	5.1	4.1	1.8	0.6	4.3	36.8	2.8	1.1	1.2	0.8	0.0	0.1	0.6	1.1	0.5	0.4	1.0	0.3
Canada (Ca)	38.9	7.4	3.0	4.0	1.7	1.2	5.1	1.8	28.1	0.3	1.4	1.2	0.3	0.2	0.9	2.7	0.4	1.0	0.4	0.1
Former USSR (USSR)	41.4	5.4	7.8	6.9	2.7	0.7	6.1	6.4	2.2	12.0	1.0	1.5	0.2	1.2	0.5	2.0	0.2	1.2	0.5	0.0
Eastern/Central Europe (ECE)	32.9	5.0	6.4	4.4	2.5	1.1	8.1	2.1	4.0	0.4	27.8	0.7	0.1	0.1	0.6	1.7	0.6	0.4	0.7	0.4
Israel (Is)	45.3	4.5	3.3	4.5	2.0	0.8	2.3	3.0	4.0	0.5	1.8	23.7	0.0	0.8	1.8	0.5	0.3	0.5	0.5	0.0
Near East (NE)	30.1	8.0	0.9	8.8	3.5	0.9	7.1	0.9	6.2	0.0	2.7	0.9	18.6	0.9	0.9	3.5	3.5	2.7	0.0	0.0
Africa (Af)	30.9	6.5	1.6	3.3	0.8	1.6	2.4	2.4	0.8	1.6	0.8	3.3	0.0	40.7	0.0	1.6	0.0	0.8	0.8	0.0
S/Ctrl America (SCA)	37.7	3.1	5.1	5.4	4.0	1.6	5.8	2.2	3.8	0.0	2.7	0.4	0.4	0.0	26.1	0.7	0.0	0.4	0.4	0.0
Australia, NZ (ANZ)	37.3	10.2	2.9	2.5	0.4	2.2	4.2	1.5	5.2	1.3	1.1	0.4	0.0	1.0	0.7	26.3	0.3	0.4	1.7	0.3
India (In)	37.1	6.4	1.4	2.5	1.8	1.4	6.0	2.8	4.2	0.7	1.8	0.4	0.0	0.0	0.7	2.1	27.2	2.8	0.4	0.4
China (Ch)	39.0	3.7	4.3	5.6	4.5	1.1	7.8	4.5	3.9	0.6	2.6	0.9	1.1	0.6	1.1	1.3	0.6	14.9	1.7	0.2
East Asian NIEs (NIE)	46.4	8.3	2.6	1.7	0.9	1.3	4.7	1.7	4.0	0.0	0.9	0.9	0.4	0.0	0.2	2.6	1.7	1.7	19.8	0.4
Asia/Pacific, other (APO) . . .	16.4	9.1	14.5	1.8	0.0	0.0	5.5	3.6	3.6	1.8	3.6	0.0	0.0	0.0	3.6	3.6	0.0	0.0	1.8	30.9

NIE = newly industrialized economy; NZ = New Zealand

NOTE: Citations are to 1987–91 articles.

SOURCES: Institute for Scientific Information, SCI data base; CHI Research Inc., *Science and Engineering Indicators* data base; and NSF special tabulations.

See figure 5-27.

Science and Engineering Indicators – 1996

Appendix table 5-42.

U.S. patents awarded to 100 academic institutions with largest 1993 R&D volume and other academic institutions: 1969–94
 (page 1 of 3)

Institution	1969–73	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
All academic patents	1125	249	320	357	363	369	264	390	436	458	434	551	588	670	819	813	1225	1176	1331	1532	1604	1761
Patents to top 100 in R&D	835	177	237	276	282	288	196	287	330	358	338	408	451	513	667	665	1004	989	1115	1294	1349	1486
Private	328	78	124	136	126	144	92	142	141	147	141	188	187	208	316	308	437	401	429	508	536	563
Public	507	99	113	140	156	144	104	145	189	211	197	220	264	305	351	357	567	588	686	786	813	923
Private institutions																						
Baylor University	0	0	1	3	4	1	1	1	3	3	2	2	3	2	7	3	8	8	6	9	11	11
Boston University	0	0	0	0	2	1	0	3	2	1	2	2	3	6	9	9	9	11	6	22	15	14
California Institute of Technology . .	60	15	27	18	16	18	12	26	16	19	16	15	16	23	27	18	56	30	36	32	29	46
Caregie Mellon University	1	1	1	2	1	4	1	0	0	0	0	3	3	3	1	2	5	3	5	10	4	8
Case Western Reserve University . .	10	3	0	4	3	0	1	1	1	0	0	1	1	6	3	1	1	2	1	9	6	8
Columbia University	0	0	0	0	0	0	0	0	0	0	2	3	4	7	6	15	19	16	8	17	17	18
Cornell University	14	3	5	11	10	10	7	11	8	6	10	14	20	13	30	16	22	34	40	41	35	39
Duke University	4	1	1	0	0	0	0	2	1	3	3	6	4	6	4	9	11	7	6	9	12	29
Emory University	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	7	3	10	6	14	5
Georgetown University	3	0	0	0	2	0	0	0	2	1	4	5	1	0	4	3	1	5	3	5	5	7
Harvard University	0	0	0	0	1	2	0	4	3	11	10	7	1	2	9	17	15	23	9	16	17	16
Johns Hopkins University	21	4	10	3	9	10	4	6	9	8	6	10	15	18	18	21	27	15	25	20	33	23
Massachusetts Institute of Technology	162	37	44	59	39	53	43	44	66	51	47	47	35	45	63	64	101	109	101	125	112	99
New York University	9	0	2	0	0	0	0	3	1	7	3	4	5	3	5	4	10	14	8	11	19	16
Northwestern University	14	1	0	0	2	7	5	7	1	7	3	2	2	8	10	10	7	5	4	8	8	12
Princeton University	0	0	0	1	0	0	0	0	1	0	0	0	0	0	2	1	12	4	13	4	11	7
Rockefeller University	0	0	0	0	1	0	1	0	3	3	1	3	5	4	9	11	6	8	14	23	23	13
Stanford University	12	7	16	19	18	10	4	11	10	4	16	36	38	33	48	54	43	36	57	42	50	62
Tulane University of Louisiana	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	3	4	4	7	5	6	6
University of Chicago	0	0	2	0	3	1	2	1	0	2	0	2	0	0	1	6	7	2	0	0	6	14
University of Miami	0	0	3	1	0	1	0	2	2	2	0	4	4	3	15	5	5	1	1	5	2	5
University of Pennsylvania	7	2	1	2	5	5	3	1	1	1	2	4	5	1	2	1	9	19	18	26	34	37
University of Rochester	0	0	0	4	2	4	0	6	7	8	9	6	2	8	9	11	11	13	12	10	11	10
University of Southern California . .	2	3	4	5	6	15	6	7	2	5	1	7	5	5	4	7	8	6	5	18	13	15
Vanderbilt University	0	0	1	1	0	2	0	1	1	2	1	0	0	5	4	4	4	5	7	4	7	6
Washington University	2	1	2	1	1	0	0	3	1	0	1	1	3	1	7	6	12	7	22	18	18	19
Woods Hole Oceanographic Institution	3	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2
Yale University	0	0	0	0	1	0	0	0	0	0	2	2	5	3	12	6	11	10	4	12	14	13
Yeshiva University	4	0	3	2	0	0	1	2	0	3	0	1	4	1	6	1	5	1	0	1	4	3

(continued)

Appendix table 5-42.

U.S. patents awarded to 100 academic institutions with largest 1993 R&D volume and other academic institutions: 1969–94
 (page 2 of 3)

Institution	1969–73	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Public institutions																						
Arizona State University	0	0	0	0	0	0	0	0	0	0	1	1	1	2	0	9	9	12	6	2	3	
Auburn University, All Campuses . .	1	0	0	1	1	1	0	1	1	0	0	0	1	1	0	0	0	2	1	5	0	2
City University of New York.	6	1	1	0	2	1	0	1	5	4	3	2	1	2	1	3	2	2	5	3	3	4
Clemson University.	2	0	0	0	1	0	4	1	0	0	0	2	2	1	3	3	6	6	2	10	4	10
Colorado State University.	4	0	1	0	0	0	0	1	0	0	0	0	1	3	4	2	0	2	4	1	4	1
Georgia Institute of Technology . .	9	5	1	1	2	2	5	3	7	8	3	6	11	9	9	7	8	18	11	16	16	20
Indiana University	31	0	1	4	4	7	2	2	1	0	3	2	4	0	3	1	6	1	3	6	1	7
Iowa State University	67	20	15	14	15	12	8	12	12	15	10	14	21	9	15	15	28	30	39	23	29	37
Louisiana State University	2	0	0	0	3	2	0	1	2	0	1	1	1	1	3	4	9	4	5	20	16	11
Michigan State University	3	0	0	4	0	2	1	2	1	1	3	3	3	10	6	8	2	7	11	19	13	21
Mississippi State University	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
New Mexico State University	0	0	1	0	0	0	0	0	0	0	2	0	0	1	2	0	0	0	1	0	2	4
North Carolina State University. .	0	0	0	0	0	0	1	0	4	1	0	2	3	4	6	5	10	14	11	24	27	32
Ohio State University	58	3	4	7	9	10	2	3	4	6	9	3	12	5	13	14	13	10	15	21	10	10
Oklahoma State University	16	1	2	2	2	0	1	1	0	2	0	1	2	2	0	2	3	4	1	2	1	1
Oregon State University	0	0	0	0	0	0	0	0	1	0	1	0	2	3	0	2	1	1	6	9	5	11
Pennsylvania State University . .	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	1	3	6	7	10	16
Purdue University	30	1	13	15	12	6	4	13	15	11	11	14	18	9	4	2	11	15	11	5	6	11
Rutgers, the State Universit	0	0	1	2	1	0	0	0	0	0	0	1	1	0	2	2	7	2	15	12	15	18
State University of New York	0	0	0	0	0	0	0	1	2	8	2	11	5	11	18	10	25	20	27	34	30	37
Texas A & M University.	0	0	0	0	0	0	1	0	3	3	2	3	8	3	6	9	8	9	12	14	22	20
University of Medicine and Dentistry of New Jersey.	0	0	0	0	0	0	0	0	0	1	1	0	1	4	7	2	4	7	2	6	1	4
University of Alabama.	2	0	0	1	4	4	2	3	2	3	1	1	5	3	5	3	3	6	3	7	6	7
University of Alaska	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3
University of Arizona.	0	0	0	0	0	2	1	2	1	1	2	1	2	2	0	0	1	2	1	1	3	6
University of California	100	22	17	22	25	23	1	2	38	42	48	46	42	54	67	60	81	64	84	80	113	162
University of Cincinnati	0	1	0	1	0	0	0	0	0	0	0	2	2	1	8	3	8	9	9	7	8	7
University of Colorado.	1	0	2	1	1	0	0	0	0	0	0	0	0	0	1	0	4	9	6	19	7	14
University of Connecticu	2	0	0	0	0	1	0	1	1	0	0	0	1	1	2	1	2	8	3	9	9	2
University of Florida	1	1	2	2	1	1	3	7	4	0	6	10	7	10	13	21	33	33	38	42	34	26
University of Georgia	0	0	0	0	1	0	0	0	0	0	7	7	5	6	3	0	3	5	8	10	18	7
University of Hawaii	0	0	1	0	1	1	1	2	0	1	1	0	2	0	1	3	2	6	2	5	8	6
University of Illinois.	32	9	9	14	11	11	6	10	8	7	8	8	10	12	4	9	15	7	8	10	13	14
University of Iowa	2	0	0	3	3	2	5	4	4	5	3	4	1	8	8	6	8	12	6	7	11	9
University of Kansas	6	0	2	2	0	0	0	2	1	0	2	2	1	0	2	0	1	3	4	7	3	2
University of Kentucky	13	6	0	0	1	3	2	5	4	6	6	7	5	7	4	7	6	4	7	7	4	3
University of Maryland	1	0	1	0	0	0	0	0	0	0	1	0	0	3	2	2	1	4	4	14	21	15
University of Massachusetts.	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	1	3	3	6	5	4	5
University of Michigan.	0	4	0	2	8	2	4	4	1	2	2	1	1	10	6	14	23	27	21	21	19	28
University of Minnesota.	30	4	5	3	5	6	7	6	12	10	5	6	11	16	28	26	40	38	32	31	27	28

(continued)

Appendix table 5-42.

U.S. patents awarded to 100 academic institutions with largest 1993 R&D volume and other academic institutions: 1969–94
 (page 3 of 3)

Institution	1969–73	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
University of Missouri	0	2	3	5	0	6	4	1	2	9	5	4	0	3	8	9	5	6	7	9	8	7
University of Nebraska	1	2	5	0	1	1	0	1	5	4	0	5	1	1	1	4	0	3	4	4	10	16
University of New Mexico	0	0	0	0	0	0	0	0	0	0	0	2	3	1	3	9	9	10	11	5	9	
University of North Carolina	2	0	1	0	0	0	0	1	0	0	1	0	0	3	2	2	6	9	3	11	14	13
University of Oklahoma	1	1	0	0	0	0	0	0	1	0	1	1	3	2	2	6	2	4	4	7	13	7
University of Pittsburgh	0	0	0	0	0	0	2	6	3	2	5	8	3	8	10	6	11	11	16	10	10	10
University of South Florida	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	2	7	5	7	4
University of Tennessee	9	1	0	0	0	0	0	0	1	1	0	1	5	8	8	8	12	14	10	11	4	5
University of Texas	0	0	0	0	1	2	0	1	6	7	5	8	20	25	21	21	51	56	84	73	86	99
University of Utah	26	2	5	7	6	12	17	12	7	14	15	9	11	7	12	9	13	14	5	13	20	22
University of Virginia	1	3	0	3	7	8	6	1	3	8	4	2	1	4	3	4	8	12	11	9	7	5
University of Washington	1	0	2	2	1	2	2	0	0	7	2	3	1	2	1	6	5	7	11	12	11	13
University of Wisconsin	40	8	17	20	25	13	7	28	26	17	13	16	17	17	11	20	27	16	45	43	57	48
Utah State University	1	1	0	0	1	0	2	2	0	0	0	1	3	2	2	1	1	2	3	2	2	2
Virginia Commonwealth University .	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	3	6	4
Virginia Polytechnic Institute and State University	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	7	4	11	18	12	16
Washington State University	2	0	0	0	0	1	2	2	1	3	2	0	2	2	2	1	5	3	3	3	2	4
Wayne State University	0	0	0	0	0	0	0	0	0	2	1	0	1	5	6	7	16	9	8	16	12	14

SOURCES: TAF Report, *U.S. Universities, 1969–1993*, U.S. Patents and Trademarks Office (September 1995); and NSF, special tabulations.

See figures 5-28 and 5-29.

Appendix table 5-43.

Patents granted to U.S. academic institutions, by major utility class: 1969–73 through 1989–94
 (page 1 of 2)

Utility class	Utility class title	1969–73	1974–78	1979–83	1984–88	1989–94
				Number		
	Total number of patents	1,125	1,658	1,982	3,441	8,630
435	Chemistry: molecular biology and microbiology	31	77	149	312	863
514	Drug, bio-affecting and body treating compositions	27	87	171	353	789
424	Drug, bio-affecting and body treating compositions	31	66	102	183	518
128	Surgery	32	49	67	125	306
250	Radiant energy	22	54	36	71	241
530	Chemistry: natural resins or derivatives; peptides or proteins	0	0	41	111	229
324	Electricity: measuring and testing	23	19	27	80	192
204	Chemistry: electrical and wave energy	28	33	47	62	188
364	Electrical computers and data processing systems	0	17	0	49	178
73	Measuring and testing	56	49	55	89	171
359	Optics: systems (including communication) and elements	19	32	30	50	158
536	Organic compounds—part of the class 532–570 series	11	26	30	43	147
427	Coating processes	0	0	0	0	137
372	Coherent light generators	12	17	0	50	135
210	Liquid purification or separation	20	32	23	47	132
257	Active solid state devices (e.g., transistors, solid state diodes)	0	0	0	0	131
395	Information processing system organization	16	0	0	0	131
505	Superconductor technology: apparatus, material, process	0	0	0	0	130
604	Surgery	0	0	29	67	117
356	Optics: measuring and testing	15	0	33	59	111
436	Chemistry: analytical and immunological testing	0	46	50	77	101
428	Stock material or miscellaneous articles	0	0	27	34	93
528	Synthetic resins or natural rubbers—part of the class 520 series	13	20	0	0	92
525	Synthetic resins or natural rubbers—part of the class 520 Series ...	0	0	20	0	90
423	Chemistry of inorganic compounds	25	38	22	0	86
437	Semiconductor device manufacturing: process	0	0	25	35	0
156	Adhesive bonding and miscellaneous chemical manufacture	0	0	0	0	0
264	Plastic and nonmetallic article shaping or treating: processes	0	0	20	0	0
623	Prosthesis (i.e., artificial body members), parts thereof, or aids	18	0	0	49	0
606	Surgery	13	0	0	43	0
607	Surgery, light, thermal, and electrical application	0	0	0	42	0
385	Optical waveguides	0	0	0	42	0
549	Organic compounds—part of the class 532–570 series	0	21	38	0	0
552	Organic compounds—part of the class 532–570 series	15	17	38	0	0
426	Food or edible material: processes, compositions, and products	17	34	36	0	0
136	Batteries: thermoelectric and photoelectric	0	0	25	0	0
126	Stoves and furnaces	0	0	19	0	0
568	Organic compounds—part of the class 532–570 series	0	32	0	0	0
378	X-ray or gamma ray systems or devices	13	26	0	0	0
546	Organic compounds—part of the class 532–570 series	0	24	0	0	0
560	Organic compounds—part of the class 532–570 series	0	18	0	0	0
56	Harvesters	26	0	0	0	0
310	Electrical generator or motor structure	23	0	0	0	0
365	Static information storage and retrieval	20	0	0	0	0
343	Communications: radio wave antennas	17	0	0	0	0
307	Electrical transmission or interconnection systems	16	0	0	0	0
434	Education and demonstration	14	0	0	0	0
209	Classifying, separating, and assorting solids	12	0	0	0	0
NA	All other utility classes	540	824	822	1,368	3,164

(continued)

Appendix table 5-43.

Patents granted to U.S. academic institutions, by major utility class: 1969–73 through 1989–94
(page 2 of 2)

Utility class	Utility class title	1969–73	1974–78	1979–83	1984–88	1989–94
		Percent				
	Total number of patents	100.0	100.0	100.0	100.0	100.0
435	Chemistry: molecular biology and microbiology	2.8	4.6	7.5	9.1	10.0
514	Drug, bio-affecting and body treating compositions	2.4	5.2	8.6	10.3	9.1
424	Drug, bio-affecting and body treating compositions	2.8	4.0	5.1	5.3	6.0
128	Surgery	2.8	3.0	3.4	3.6	3.5
250	Radiant energy	2.0	3.3	1.8	2.1	2.8
530	Chemistry: natural resins or derivatives; peptides or proteins	0.0	0.0	2.1	3.2	2.7
324	Electricity: measuring and testing	2.0	1.1	1.4	2.3	2.2
204	Chemistry: electrical and wave energy	2.5	2.0	2.4	1.8	2.2
364	Electrical computers and data processing systems	0.0	1.0	0.0	1.4	2.1
73	Measuring and testing	5.0	3.0	2.8	2.6	2.0
359	Optics: systems (including communication) and elements	1.7	1.9	1.5	1.5	1.8
536	Organic compounds—part of the class 532–570 series	1.0	1.6	1.5	1.2	1.7
427	Coating processes	0.0	0.0	0.0	0.0	1.6
372	Coherent light generators	1.1	1.0	0.0	1.5	1.6
210	Liquid purification or separation	1.8	1.9	1.2	1.4	1.5
257	Active solid state devices (e.g., transistors, solid state diodes)	0.0	0.0	0.0	0.0	1.5
395	Information processing system organization	1.4	0.0	0.0	0.0	1.5
505	Superconductor technology: apparatus, material, process	0.0	0.0	0.0	0.0	1.5
604	Surgery	0.0	0.0	1.5	1.9	1.4
356	Optics: measuring and testing	1.3	0.0	1.7	1.7	1.3
436	Chemistry: analytical and immunological testing	0.0	2.8	2.5	2.2	1.2
428	Stock material or miscellaneous articles	0.0	0.0	1.4	1.0	1.1
528	Synthetic resins or natural rubbers—part of the class 520 series	1.2	1.2	0.0	0.0	1.1
525	Synthetic resins or natural rubbers—part of the class 520 series	0.0	0.0	1.0	0.0	1.0
423	Chemistry of inorganic compounds	2.2	2.3	1.1	0.0	1.0
437	Semiconductor device manufacturing: process	0.0	0.0	1.3	1.0	0.0
156	Adhesive bonding and miscellaneous chemical manufacture	0.0	0.0	0.0	0.0	0.0
264	Plastic and nonmetallic article shaping or treating: processes	0.0	0.0	1.0	0.0	0.0
623	Prostheses (i.e., artificial body members), parts thereof, or aids	1.6	0.0	0.0	1.4	0.0
606	Surgery	1.2	0.0	0.0	1.2	0.0
607	Surgery, light, thermal, and electrical application	0.0	0.0	0.0	1.2	0.0
385	Optical waveguides	0.0	0.0	0.0	1.2	0.0
549	Organic compounds—part of the class 532–570 series	0.0	1.3	1.9	0.0	0.0
552	Organic compounds—part of the class 532–570 series	1.3	1.0	1.9	0.0	0.0
426	Food or edible material: processes, compositions, and products	1.5	2.1	1.8	0.0	0.0
136	Batteries: thermoelectric and photoelectric	0.0	0.0	1.3	0.0	0.0
126	Stoves and furnaces	0.0	0.0	1.0	0.0	0.0
568	Organic compounds--part of the class 532–570 series	0.0	1.9	0.0	0.0	0.0
378	X-ray or gamma ray systems or devices	1.2	1.6	0.0	0.0	0.0
546	Organic compounds—part of the class 532–570 series	0.0	1.4	0.0	0.0	0.0
560	Organic compounds—part of the class 532–570 series	0.0	1.1	0.0	0.0	0.0
56	Harvesters	2.3	0.0	0.0	0.0	0.0
310	Electrical generator or motor structure	2.0	0.0	0.0	0.0	0.0
365	Static information storage and retrieval	1.8	0.0	0.0	0.0	0.0
343	Communications: radio wave antennas	1.5	0.0	0.0	0.0	0.0
307	Electrical transmission or interconnection systems	1.4	0.0	0.0	0.0	0.0
434	Education and demonstration	1.2	0.0	0.0	0.0	0.0
209	Classifying, separating, and assorting solids	1.1	0.0	0.0	0.0	0.0
NA	All other utility classes	48.0	49.7	41.5	39.8	36.7

NA = not applicable; – = utility classes contributing less than 1 percent of academic total in a given time period

NOTES: Utility classes contributing less than 1 percent of academic total in a given time period not shown separately. Last period comprised of six years, all others of five.

SOURCE: Technology Assessment and Forecast Program, U.S. Patent and Trademark Office, *U.S. Universities 1969–1993* (Washington, DC: September 1994).

See figures 5-30 and 5-31.